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NOTES ON THE UTILIZATION OF FORESTS.

(*Continued from page 345*).

Section VI.—Conversion.

It will be most convenient to take up separately (1) the rough and ready conversion, such as can be effected by any gang of woodmen and which all felled material must undergo before it can be removed from the coupe, and (2) conversion into sawn goods. The manufacture of staves has already been described (pp. 135-136), and references have been made in various places to the preparation of felloes, sleepers, and some other classes of manufactured goods, which may be wrought in the forest.

Article I.—Rough Conversion.

In every felling a certain amount of conversion is indispensable, primarily in order to reduce the produce to exportable dimensions, and secondarily to reduce the cost of export (for it is waste of money to carry out material that serves no purpose at all and has ultimately to be got rid of), and to render the produce readily saleable at the highest prices it can command. Hence the mode and extent of conversion in any case in question will depend on the purposes which the unmanufactured produce can be made to serve, on the demand and prevailing prices, and on the accessibility of the forest to the centres of consumption. The more valuable the timber is and the larger the demand for it, the more carefully and the more extensively must the felled material be converted. The question of conversion is, therefore, of the highest importance in the working of a forest, and requires on the part of the management an intimate knowledge of prevailing sylvicultural and economical conditions and frequently no little skill.

The procedure to follow in effecting rough conversion will be best stated in the form of briefly-worded rules, thus :—

I.—When practicable, the saw should be used, in order both to save material and to avoid, as much as possible, encumbering the soil with chips of wood. On steep ground, and where the trees lie all in a heap one over another, the use of the axe on a very large scale cannot be helped.

II.—The first thing to do after a tree has been felled is to trim off all branches and conspicuous projections. While this is being done, a number of men should work at the detached branches, the portions fit for timber being separated and trimmed like the trunk, and the rest cut and split up into firewood.

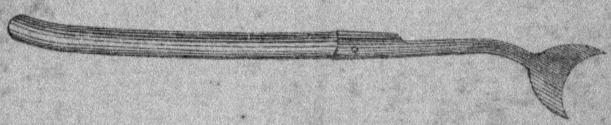
III.—Now cut up the trunk ; if necessary, removing from it what is fit only for fuel.

IV.—The timber portions should be kept as long as possible, in order to furnish the largest kinds of timber, while still being capable of being cut up into smaller goods. Division is necessary only when definite lengths of log are required (as when sleepers are to be sawn), or when the nature of the ground and communications place a bar on the export of logs above a certain size, or when the lower part has obviously a different utility from the upper.

V.—Timber must be presented to the purchaser in its most attractive aspect, and at least in such a form as will enable him to judge readily and with certainty of its quality and its suitability for his purpose. In round or roughly dressed timber, all burrs, prominent knots, and other excrescences, &c., should be cut through and exposed ; when straight pieces are required, all irregularities should be adzed off.

VI.—The bark may be removed by beating it with the back of an axe or with a special tool (*Fig.* 51), which is also useful when

Fig. 51.



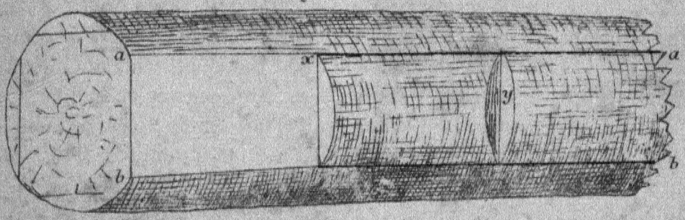
Tools for stripping the bark off logs. (*After Gayer*).

the bark has to be taken off only along certain lines, as described on page 12. The immediate removal of bark is a great protection against insects ; but, on the other hand, in hot dry weather it leads to too rapid drying, and consequently to extensive splitting and cracking, unless the timber is worked up within a few weeks, or

sometimes even days. Teak poles have, however, been known to remain free from insects throughout an entire rainy season if fully exposed to the rain, and then the dry bark has readily come off like a loose jacket, giving no chance to insects.

VII.—If the logs are to be carried over long distances by land before being sawn up, it will generally be found advantageous to rough-square them (convert them into balks). The procedure is as follows:—Having fixed the log firmly and in a convenient position for work and for obtaining from it the largest balk it can yield, the workman traces on the section at the thicker end, with the aid of a plummet and line and a carpenter's square, the lines of the four faces to be hewn (*Fig.* 52). Then, with a cord steeped

Fig. 52.



Mode of rough-squaring logs.

in water in which pounded charcoal or red hæmatite has been mixed, he marks along the entire length of the log the lines *aa* and *bb*, which should follow as nearly as possible the outline of the log, and be as nearly parallel to one another as the taper and shape of the log will allow. This being done, he proceeds to hew with an axe the two vertical faces. But to enable him to work quickly and with accuracy, he begins by making at short intervals a number of guide cross-cuts *x*, *y*, *z*....., the lines forming the bottom of which are vertical, so that all he has to do afterwards is to flitch off the portions between the cuts. It is always more convenient to stand upon the log while axing it, but not unfrequently our Indian wood-cutters stand on the ground next to the face which they are engaged in dressing. The remaining two faces are dressed in the same way, after changing the position of the log.

VIII.—Rough timber is adzed with the aid of the eye alone,

the eight several faces, in order to diminish waste as much as possible, following closely the general outline of the log.

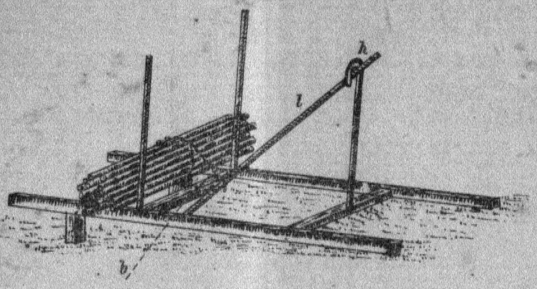
IX.—In preparing sided timber the workmen, after fixing the log firmly, must split it open along the vertical diameter of the lower section. The split must then be extended along the length of the log by constantly driving in a new wedge in front of the one last inserted and gradually forcing them home. No little skill is required to make the split follow more or less the same diametral plane from the beginning. The two halves are then dressed with the axe.

X.—Tors of heartwood alone are dressed with the axe. No guiding lines are traced, and the workman follows mainly the run of the heartwood, of which he endeavours to leave as much as possible, even at the sacrifice of straightness and regularity of shape, if the heartwood forms an irregular figure.

XI.—Firewood naturally divides itself into three broad classes, according as it consists of sections split from thick stuff or of unsplit billets or of small branchwood and the small stuff obtained by splitting up stumps and roots. These three classes should be separated at once as the tree is cut up. The rounds and thick billets from which the first class is obtained are taken off by sawing, and in India are usually from 2 to 3 feet long. The rounds are stood up on end, and a first split is made with axes driven in at two or three points along a diameter. When the split has been opened enough, before the axe is drawn out, wedges are inserted, 2, 3, or 4, according to the size and fissility of the round. These wedges are then driven home. It is advisable to have two men to each round, working opposite one another. If the halves thus obtained are too large, they are further divided into quarters, and so on. Sometimes the billets to be split are too thin to stand up. In that case they must be laid lengthwise on the ground, with one end raised on a small billet, the splitting being begun at this end. The third class of firewood is too small to be conveniently moved without being tied up into bundles, whence the name of *faggot-wood* usually given to it. Small branches and branchlets are quickly formed into faggots by fixing four uprights firmly in the ground in pairs, the interval between the two pairs being equal to the diameter of the required faggot. The sticks are arranged between the pairs across one or more withies laid on the ground. When enough of sticks have been put on, the workman presses them down with one foot, while he binds up the withies. On taking his foot off, the expansive force of the pieces now released from pressure fixes firmly the twisted free ends of the withies. Perhaps a more convenient

and time-saving apparatus is that shown in *Fig.* 53. The lever *l*,

Fig. 53.



Faggot-binder's Press.

the lower end of which rests up against the bar *b*, is drawn towards the operator and hitched into the hook *h*, thus tightening the chain over the bundle of sticks. The withy can now be tied up and the pressure on the faggot released by unhitching the lever. The length of the chain, which can be varied, regulates exactly the size of the faggot.

XII.—In the midst of abundant reproduction, as in seed and after-fellings and in jardinage coupes, and also in thinnings in a young forest, the less the amount of conversion effected on the coupe, the better for the safety of the standing stock. Hence all pieces that can be easily carried, such as poles, rounds, &c., should be taken out at once to the nearest roadside or large blank and cut up there. The same thing must be done in coppice coupes, when the time, before the new re-growth makes its appearance, is very limited. So also in the case of transport by water ; the pieces should be taken out as long as possible and cut up only on arrival at destination.

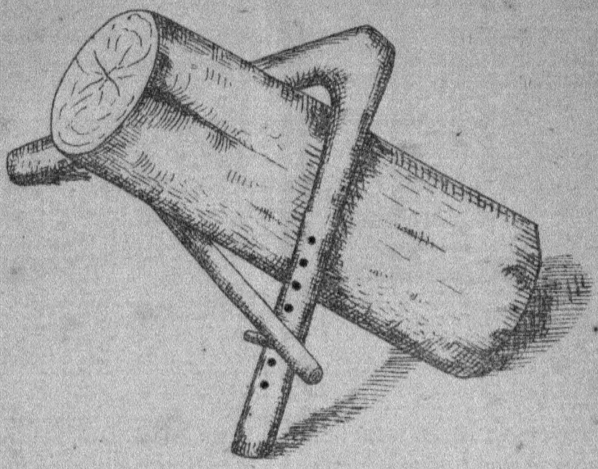
Article 2.—Further conversion of timber with the saw.

No reference will be made here to sawing by machinery, which is of too exceptional a character in India.

The first thing to do is to rough-square the logs in order to be able to fix them firmly enough for sawing. The amount of squaring required is of the very slightest, and may often be reduced to merely dressing one side flat enough to lie evenly on the trestles.

When the contrivance represented in *Fig.* 54 is used to support

Fig. 54.



Delhi Sawyer's triangular trestle.

the log, it will suffice to trim off only all prominent irregularities.

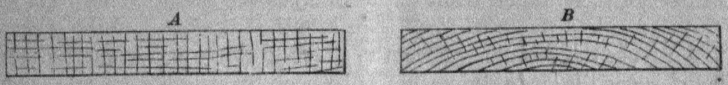
Next, the lines along which the saw must cut should be marked with a string in the same way as for rough-squaring. The section of every scantling to be cut should be accurately traced on both ends of the log. The first set of lines at both ends should be drawn vertically with the aid of a plummet ; the rest will, in nearly every case, run at right angles to these, and can then be ruled with the help of a carpenter's square. Before beginning any cut, the plane along which it is to run should be accurately indicated by joining the extremities of the corresponding lines traced at the two ends. In order to save time, as many such lines as possible should be marked off all at once. The slabs flitched off by the first cuts may often be thick enough to yield small scantlings.

The wood at the centre of a log is, as a rule, specially liable to decompose quickly and to warp and split. Hence this part should be removed if the sawn goods are to be used for any important purpose.

Speaking in a general manner, the saw-cuts may follow a radius or a tangent. In the first case, the entire width of the medullary rays, the *silver grain*, is made visible (whence the designation for this mode of sawing of "sawing with the silver grain"), and the layers of concentric growth run through the piece at right angles to the

surface of section (*Fig.* 55-A). The medullary plates, being lustrous

Fig. 55.

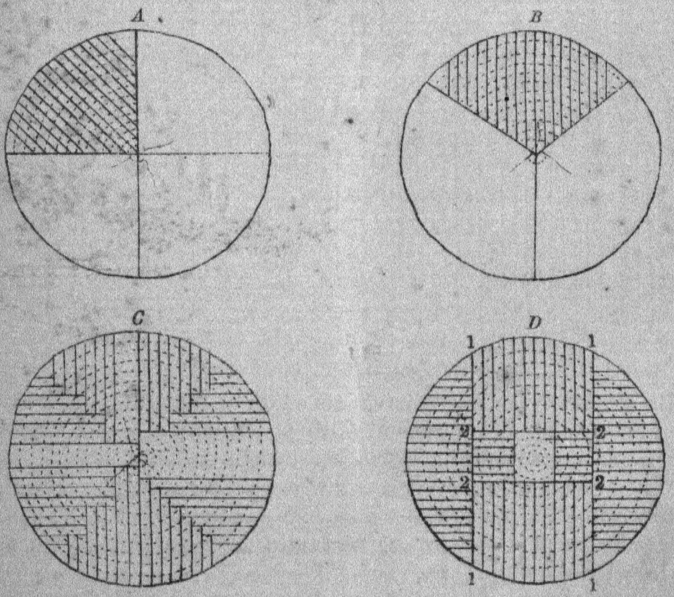


Sawing (A) with, and (B) across, the Silver Grain.

and harder than the wood fibres, contribute very greatly both to the beauty and lasting quality of the surface, while the uniform disposition of the concentric layers prevents, or at least minimises, any tendency to warp. On the other hand, a tangential section (*Fig.* 55-B) exposes principally the softer fibrous tissue, and the irregular distribution of the concentric layers exaggerates the tendency to warp in the direction of the concavity of these layers, and the medullary plates are invisible, except when they are extraordinarily thick, as in oaks. Actually the sections are seldom perfectly radial or tangential, but approach more or less one or the other of these two directions. For pieces in which beauty is a requisite, or for surfaces which, like floors, are subject to much wear and tear, sawing with the silver grain is essential.

Fig. 56 exhibits several modes of sawing with the silver-grain.

Fig. 56.

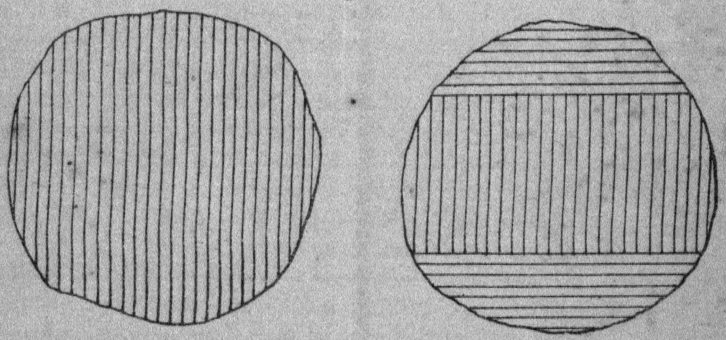


Several methods of sawing with the Silver Grain.

Methods *A* and *B* are practically the same, except that the latter gives more broad planks, although at a slight sacrifice of quality in respect of those taken from the outside of each section. In method *C* there is less waste of wood than in either *A* or *B*, and the pieces taken from the middle, where the silver grain is best exposed, can be of specially large dimensions. In each quadrant the planks can be taken off alternately one from each side, or alternately two and two, or three and three, or irregularly if the log is strongly elliptical. All three patterns, *A*, *B*, and *C*, possess this capital defect, that the widths of the planks cut are very different. This defect is, however, avoided in pattern *D*. In patterns *A* and *B* the wood of the centre of the logs, which is always of doubtful quality, is necessarily removed in squaring the inside edge of the planks. In patterns *C* and *D* the centre of the log has to be specially cut out. Besides that most of the methods of sawing with the silver grain yield planks of very various widths, the width of the widest planks is not even equal to the radius of the log. Hence, except for very special purposes, it is not usual to saw with the silver grain, and it is preferable to adopt a mixed style of sawing, which will always give a certain proportion of goods showing the silver grain.

Two very frequently used methods of mixed sawing adopted for cutting out planks and boards are those represented in *Fig.* 57, *A* and *B*. *A* gives pieces of different widths, *B* pieces mostly of one

Fig. 57.



Ordinary methods of mixed sawing.

and the same width. The irregular edges of the planks taken off in *A* and from the side slabs in *B* can be sawn square with a single cut by placing several planks together one over another.

When pieces of different scantlings are in demand, it is best to obtain from each log as many of the highest-priced classes as possible. These should, therefore, be traced first of all on the ends of the logs, the remaining space being filled up as completely as possible

with traces for inferior scantlings. In this way alone can the largest money-return be obtained from a given log and the wastage in sawing reduced to a minimum. Under the most favourable circumstances the wastage, resulting both from sawdust and from pieces that cannot be utilized, except as firewood, is never less than 22 per cent. if there is no objection to sapwood, or 33 per cent. if only heartwood is allowed. When only a single class of thick stuff is demanded, such as railway sleepers, the loss, even in cutting up perfectly sound logs, attains half the volume of the log.

When pit-saws are used, owing to their great length (8 feet), unless the logs themselves are long, these latter must be supported several feet off the ground across a pair of strong parallel trestles firmly fixed in the ground. With shorter saws it will suffice to raise only one end of the log by resting it on a single trestle, or, if the log is long enough, even across another log laid horizontally. The most convenient support for logs that are not too heavy is the triangular trestle so often used in the plains of Northern India (*Fig.* 54). When only one end of the log is raised off the ground, the oblique position of the log makes the footing of the top-sawyer unsafe. To remedy this, a slab, one face of which is cut into teeth having the section of a right angle, is placed upon the sloping log with the smooth face downwards.

Section VII.—Clearing the Coupe.

The produce may be removed either by rolling or dragging, or carrying on men's shoulders, or on wheels, or by sliding or sledging, or by letting it shoot down inclined ground or along a specially made channel. More than one of these methods may be employed together, and in choosing the method or methods to adopt, the objects to keep in view are economy and the safety of the forest and soil as well as of the produce itself. The method to employ will also depend on the amount and price of labour available, the cost of cattle, and on the nature of the ground.

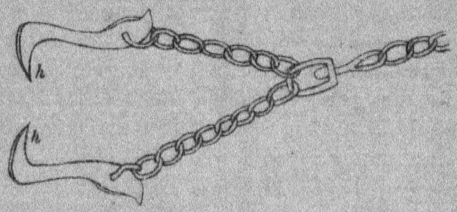
In clearing a coupe the different classes of produce must throughout be carefully kept separate, and it is always advisable to get the same gang to take out the produce, which cut and converted it.

Rolling can be adopted only on ground that bears no reproduction, and is at the same time fairly clear of trees, rocks, and other obstructions. If the ground slopes a little, so much the better. On steep ground logs can be rolled only in unfrequented localities, on account of the extreme danger to human life resulting. Rolling is a very easy mode of moving logs, being effected with ordinary poles cut to a wedge shape at the lower end, or, better still, with

the lever and hook represented in *Fig.* 47. Trained elephants do the work very effectively and expeditiously on level ground.

Dragging may be effected either with human power or with draught cattle, according to the size of the piece or collection of pieces to be dragged. In the latter case a chain is fastened round the log and its ends attached to the yoke or traces, as the case may be. To save the trouble of fastening the chain to the log and then unfastening it, the contrivance shown in *Fig.* 58 may be used, two

Fig. 58.



Dragging Grappling-Hook. (*After Gayer*).

holes being scooped in each side of the log to receive the end of the hooks *h*, *h*. The log is firmly held by the hooks in proportion to the tension of the draught. Simple levers have nearly always to be used to control the moving log or to lift the forward end off obstacles.

Pieces weighing up to 800 and even 1,000 pounds may be carried out on men's shoulders, if the lead is short.

Carts and barrows should be used only when the lead is long; otherwise the labour and time spent in loading and unloading cease to make this mode of transport an economical one. Large logs are always much more cheaply dragged, especially if they are suspended, more or less by the middle, from the axle of a pair of high wheels. The hind end should slightly over-balance, but not to such an extent as to prevent one or two men from holding it off the ground, if necessary. If the axle-tree consists of wood, the ends may be made like a capstan head, to enable the log to be easily raised off the ground. The use of wheeled conveyance is of course limited to level even ground.

Only large logs may be taken out by sliding. On more or less level ground sliding is similar to dragging, except that the logs must be moved entirely on rollers. A simple device is to use two or three strong portable frames carrying well-turned rollers. As the log is slid off the hindmost frame, this latter is carried forward and placed in front of the advancing log. On slopes the logs may be pushed forward with levers. If the depôt to which the logs have at once to be taken is some distance off, and the quantity of timber

to be moved is large and concentrated within a limited area, a special sliding road may be made.

In this last case, if the pieces to be moved are small, a sledge road may be made instead of a slide, and a rough continuation of the road may be readily laid down (and as readily taken up) along successive lines of the coupe as the area is progressively cleared.

On very steep gradients the produce may be allowed to slide down of its own weight. No difficulty presents itself when the produce is to be collected at the bottom of the slope, except that the pieces *may* break and lose in value as timber. If the produce has to be arrested above the bottom of the valley, special works must be built up for the purpose. A channel or shoot, constructed of wood, may be used for the rapid transport of billets, for which class of produce this mode of moving is peculiarly well adapted.

Section VIII.—Seasoning and stacking in the forest.

Until the produce removed from the coupe is finally disposed of, it must be stacked so as to season properly, without becoming full of cracks and shakes and without being exposed to decompose or be attacked by insects or fungi. In the case of pieces not more than a few inches thick, judicious packing prevents them from bending or warping, and helps to straighten those which are originally crooked.

In whatever way the wood is kept, the stacks or groups should be all of the same dimensions or contain the same number of pieces. There is no other way of keeping a correct and ready account of the produce.

1. *Seasoning and stacking of large unsawn timber.*

Such timber should of course be allowed to dry slowly and evenly. It should, therefore, be kept under shade if possible, but air should be allowed to play freely round each piece, especially if the season and the ground be damp. The pieces should hence be kept off the ground by skidding, unless they are to be removed again almost at once, in which case no stacking is necessary, the logs being simply placed together side by side in equal groups with the thicker ends all directed one way.

If the timber is to be kept for months, it should be carefully stacked as follows :—The lowest tier should be raised at least a foot off the ground and contain the largest and heaviest pieces, and there should be skidding of some inches under each one of the other tiers, the skidding being in every case perfectly level. The logs in each stack should have their butt ends all on one and the same side. Although free ventilation is necessary, a con-

tinuous current of air, especially of hot, dry air, should be kept out, and hence, where steady winds prevail, a screen of thatch should be erected on the windward side of each stack.

If it is necessary to take out a log here and a log there, it should be possible to do this without breaking up the stack. For this purpose, the smaller ends of all the logs should be kept slightly higher than the butts with small blocks of wood, and under the skidding over each tier should be packed similar blocks of wood from 1½ to 2 inches thick. By pushing away this packing, any log between two layers of skidding may be withdrawn without disturbing the remainder.

2. *Seasoning and stacking of sawn material.*

Thick stuff must always be put up in stacks without delay, in order to prevent them from drying too fast. When the pieces are not broad, the tiers may be laid directly one over another, the lowest tier alone being skidded perfectly level off the ground. In this case, the pieces in two successive tiers will cross one another at right angles. An inch or two of space should be left between every two pieces in each tier. If individual pieces are likely to be required from time to time, it should be possible to take them out without breaking up the stack, and then small blocks should be placed under each piece; as soon as these blocks are pushed away, the piece which was resting on them can be at once drawn out. If the pieces are wide, each tier should be blocked below by laths from 1 to 3 inches thick and 3 to 4 inches broad. In every case, the last tier should be sheltered from sun, rain, and wind with a covering of thatch or inferior slabs of wood.

Thin deals, boards, and battens are extremely liable to warp strongly almost as soon as they have been sawn. They should be stacked without delay and kept as close together as possible until they are fairly dry, when they should be stacked like broad thick stuff. The last tier should be well weighted to prevent warping and sheltered in the usual way. Even if the timber is to be removed almost immediately, it should be stacked close together, as without the most careful and unremitting precautions a very large proportion of newly sawn stuff will be rendered useless or at least have its value considerably lessened by cracks and warping.

3. *Stacking and seasoning of poles and posts.*

While they are still green, poles should be piled up horizontally in stacks between pairs of vertical posts fixed firmly in the ground, and they should be well weighted on the top, in order to straighten those which are crooked and to prevent straight ones from becom-

ing crooked in drying. If the stacks are not to be disturbed for some time, a few cross pieces should be laid under them on the ground as skidding.

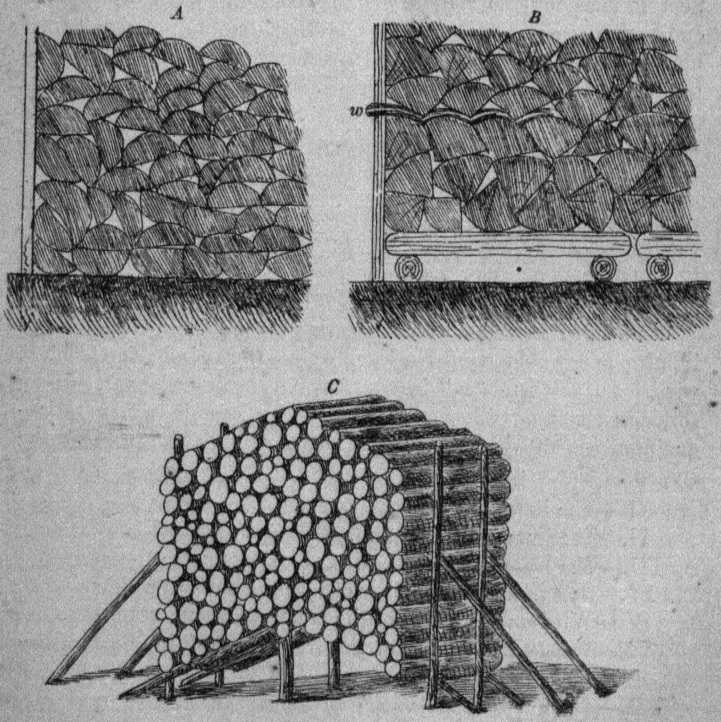
A common method adopted in many parts of India is to stand up the poles close together round the trunk of a tree, the thick end being on the ground. Placed thus, the poles are freely exposed to air and their upright position causes the sap to run down. Moreover, the crown of the supporting tree shelters the thin ends. Obviously only straight poles should be so stacked.

Posts may be stacked according to either of the two methods just described, but the second is preferable, as, even if they are crooked, they are not capable of being straightened under ordinary pressure, and straight ones cannot become appreciably crooked.

4. *Stacking of firewood.*

Fig. 59 explains at once how to stack firewood. In *A* the pieces

Fig. 59.



Methods of stacking firewood. (After Gayer).

are in direct contact with the soil; in *B* they rest on billets laid crosswise on the ground; while in *C* the whole stack is completely raised off the ground and there is free play of air underneath. In every stack the pieces should be all of the same length and belong to the same category of firewood. The height of a stack should be uniform throughout, and should be such a figure that the height multiplied by the breadth should give a constant whole number—if possible, the number 10,—so that we have to measure only the length of a stack to know at once its contents. As the wood is bound to shrink considerably, causing the stack to settle down and its breadth to diminish, it is usual to allow the product to slightly exceed the figure really required; but in finding out contents it is always best to use this latter figure. On slopes a horizontal terrace is easily prepared for the site of a stack. To prevent the uprights, which support the stack, from being thrust away outwards, each of them may be strutted, or a strip of strong fibrous bark or a long withy may be put round each upright, as shown at *w* in *Fig.* 58, *B*, and kept in place by the weight of the wood lying on its united free ends. If necessary, two such ties or straps may be put round each upright. It is needless to say that the firewood pieces should be packed together as closely as possible.

CHAPTER IV.—DISPOSAL AND SALE OF WOOD IN THE FOREST.

The question of supplying right-holders with the wood to which they are entitled belongs to the province of forest law, to which the student must refer for information. Here we shall concern ourselves only with wood to be disposed of by sale.

The conditions under which the sale of wood may be effected are infinite, and would require a large volume to be adequately dealt with. For our purpose it is necessary only to describe very briefly the most characteristic elementary systems of sale, a general acquaintance with which ought to suffice to form the judgment of the student. These systems are:—

I.—The license or permit system.
II.—The kham tahsil system.
III.—The lease system.
IV.—Sale of a small number of selected trees at a time.
V.—Wholesale disposal of the trees of a coupe standing.
VI.—Wholesale disposal of the trees on the coupe after they have fallen
VII.—The forest depôt system.

Section I.—The License or Permit System.

In this system the would-be purchaser must, before he can enter the forest and begin to cut and collect his wood, purchase a license or permit, which, besides setting forth in detail the nature and the quantity of the produce he is authorized to remove, lays down certain conditions to be strictly observed, which have for their object the safety of the forest and easy and effective exercise of the necessary check over his action. For this purpose the permit must define the area within which he must cut, specify the road by which he must take out his produce, fix the period within which he must pass it out, and make it compulsory for him to submit his license and his goods to examination whenever called upon to do so by any competent Forest Officer. The license is usually in foil and counterfoil, the former being given to the purchaser, the latter being retained by the vendor for submission to the Accounts Office. Sometimes the foil is double, so that one part may be torn off by the person checking the produce when it first passes out of the forest, and sent independently of the counterfoil to the Accounts Office to be compared with this latter. Besides this advantage of the double foil, the possession of only one part by a man inside the forest is proof positive of attempted fraud, as this part is meant only to enable him to pass on his produce to market or to his house, and to protect it as long as it remains with him. The check can of course be nearly as complete even when only a single foil is used, for the foil can be cancelled by means of some mark or endorsement as soon as the produce has left the forest; but the double foil license is absolutely simpler to work, and in the present illiterate condition of the country folk and forest guards is also much more practical.

The amount of money paid for the license may be written on it, but illiterate purchasers are liable to be defrauded thereby, and in case of collusion between the vending and checking establishments, the forest revenue may suffer, as there is nothing easier than to enter different quantities and sums on foil and counterfoil, the counterfoil, in order to render detection more difficult, being written up only after the produce has been removed and the foil recovered and destroyed. It is, therefore, safest to indicate the value paid and received by means of colours and some readily recognized symbols impressed on the license or of adhesive labels resembling postage stamps affixed to it. In the case of different colours and symbols being employed, each license will possess an unchangeable value, whereas by means of adhesive labels it can

be made to bear any value. This latter mode of denoting value is evidently much the better one. The stamps can be cancelled at once by the vendor, either in the same way as postage stamps, or by being punched through like court-fee stamps and railway tickets. Characteristic marks or letters can be similarly punched through at each check station or in each beat passed or traversed by the purchaser, thus denoting at once the route which he has followed and the extent to which he was under surveillance.

In the beginning of the system the vendors were also members of the checking establishment. In many places this is still the case; but a great improvement effected in many others has been to authorize selected village headmen and patwaris to sell the licenses under the supervision of Forest Officers of and above the rank of Ranger, so that the people need never have to go far for a license, and the revenue is collected, as it should be, by men entirely distinct and removed from the protective establishment.

The license or permit system is an excellent one to adopt for small produce where the demand is comparatively light and there are no regular dealers and no near markets. The consumers being generally too poor to pay the profits of middlemen, purchase their produce directly from the forest, and cut and remove it themselves at seasons when they and their cattle are free from labour in the fields. To prevent over-cutting, the forest should be divided into blocks, which are closed and opened in rotation. Under the strictest supervision a certain amount of damage to the forest is inevitable, and hence as soon as the demand becomes large enough to require and pay for more intensive management and to create a class of regular dealers, the system must be abandoned for one that gives greater control to the conservancy establishment over the exploitation of the forest. Nevertheless, until the trade in timber and firewood has obtained a very high development, it will generally be found advantageous to retain some form of the license system for the disposal of the very small wood which is of too low a value to bear long carriage. Two simple systems applicable in this case are those of tickets of fixed value, valid respectively only for the day of issue and for a month. The former leaves less room for fraud, but requires the establishment of vending stations on every line of export. Tickets valid for a whole month may be issued from a single central office. Such tickets are used with great success at Naini Tal, where they are made of brass, are consecutively numbered, and authorize the holder to remove head-loads of small firewood, of which, owing to the distance he has to travel, he

cannot take out more than one a day. Infraction of the conditions under which the tickets are issued render the holder liable to forfeiture of his ticket, without prejudice to punishment under the law.

The license or permit system, in some form or other, prevails, as is to be expected, over more than half the forests of the empire.

Section II.—The Kham Tahsil System.

In this system the would-be purchaser may enter the forest and cut and collect whatever he pleases within the authorised classes of produce, and he pays for what he carries away and obtains a pass for it only after he has taken it out of the forest and reaches a station where the money is levied and such pass issued. The system can of course be adopted only in forests from which there is a limited number of outlets. Such are forests situated in a mountainous country from which everything must pass out by the valleys, or forests lying behind a range of hills which are crossed by only a few passes, or remote forests for which the main highway to populous centres consists of one or a few large rivers. A very great disadvantage of this system, which is inseparable from the mode in which the revenue is collected, is that it provides no check on wasteful or fraudulent cutting. Any one may fell more than he can or intends to take out, and dishonest people may cut without fear, in the hope of being able to smuggle out some part of the produce. The case is worst of all when the protective and revenue-collecting establishments conspire together with the smugglers. To minimise the chances of such collusion, the following precautions have to be taken :—(1). To establish two parallel lines of stations as far apart from one another as possible, the stations of the first line being on the edge of the forest. (2). On any consignment of produce reaching the first line, it should be counted or measured up and a pass issued thereon. (3). At the second line of stations, this pass and the produce should be checked together, and if no discrepancy be found, the pass should be taken away, the price of the produce collected, and a fresh pass issued. (4). Counterfoils, or in their stead a statement detailing their contents, should be despatched to the control office on the very day of issue. (5). Separate, responsible, well-paid inspecting officers should constantly patrol both lines of stations. If found more practical, the respective functions of the two parallel lines of stations can of course be reversed, the money being levied on

the first line, and only a fresh pass issued at the second in lieu of the original pass issued on receipt of the royalty.

A very primitive form of the kham tahsil system is that in which the people who cut and bring the produce to the revenue stations are not purchasers at all, but act merely as wood-cutters and carriers. The purchasers themselves need not go nearer the forests than those stations. When the produce reaches such a station, the men who have brought it are paid for cutting, conversion, and carriage, and the purchaser, after paying royalty to the official in charge of the station, obtains a pass and takes away the produce under cover of it. This system has been adopted, as a matter of policy, in forests inhabited by poor aboriginal tribes, whose nearly sole means of subsistence is wood-cutting. It is also in force in some places for the working of bamboo forest.

Under the most favourable circumstances the kham tahsil system is a very clumsy one, and can have only a very limited application. Besides labouring under the essential drawback of requiring certain exceptional topographical features, it can, like the license system, be adopted for only the inferior classes of produce, and it is far more open to fraud than any other system. When the configuration of the country permits of its adoption, it may be resorted to temporarily, to encourage an incipient or languishing export trade, especially if the forest population is a very poor one and dependent for its livelihood chiefly on the wood-cutter's craft.

Section III.—The Lease System.

In this system the lessee purchases the right to utilize and remove, during the term of the lease, as much of the specified classes of trees or produce as he has the time and ability to take out. Before any beginning was made in forest conservancy, certain forests were leased out for every article it produced, and even at the present day impecunious private proprietors, and indeed also rajahs, give out their forests on such terms. It is evident that a lease of this wholesale kind means the rapid extermination of the forest, and that the system itself is adapted only for the removal of inferior material from forests on which there is only an insignificant demand. Indeed, the lease system in any form is justifiable only when it is adopted to encourage the beginning of a trade in wood. Hence it is peculiarly suitable for clearing out of forests, that cannot otherwise be worked, the few trees that die and fall naturally every year. In the case of a large accumulation of dead material, the system would be justified only in the absence of a keen

competition to obtain this material. Under any other circumstances the lessee would always be tempted to try to pass off green for dead wood, and, if he could afford to wait, to kill a number of valuable living trees, which he would extract after they were dead. As the number of trees that die each year from natural causes is, under normal conditions, comparatively insignificant, the forest should be divided into blocks, each block being leased in turn only at the end of a period long enough to allow of a sufficient accumulation of dead wood to attract purchasers and thus command remunerative prices.

The forests of the Saharanpur Division of the School Circle, containing, as they do, a very inferior stock, are a good illustration of the successful application of the lease system, but the interval during which each block has rest would perhaps with advantage be extended.

The weakest point in the lease system is that, as the lessee pays down a fixed lump sum, it is his interest to remove as much produce as he can, and he is, therefore, under constant strong temptation to take out also what he has no title to. The lease system is totally unsuited for the working of bamboo forest, as no amount of precaution will prevent over-cutting in individual clumps.

The lease money may be recovered in one instalment before the lessee is allowed to begin operations or recovered in two or more instalments, the first to be paid down immediately on conclusion of the sale, the last while there is still enough produce in the forest to cover the balance due. In the case of petty sales it is best to exact a single instalment paid in advance.

SECTION IV.—SALE OF A SMALL NUMBER OF SELECTED TREES AT A TIME.

Under this system a small number of trees are given on special application, the applicants being generally the would-be consumers themselves or petty tradesmen. This is the mode of sale to adopt when the demand is insignificant and irregular and is limited to large and valuable timber. It is specially well adapted for the sale of the larger and more valuable trees standing in areas which are worked for the less valuable portion of the material by the license or the kham tahsil system. It may also be employed for the disposal of the best trees in regular coupes; but in this case there is always risk of the value of the remaining produce being depreciated out of proportion, owing to the previous removal of the best material, and in some cases the depreciated stock may even fail to find a purchaser.

The trees selected for removal may of course include dead and naturally fallen trees as well as those standing. Standing trees should be marked at the foot only if they are to be converted before removal, and at the foot and also just above the place where they are to be cut off, if the trunk is to be taken out round. When the produce is converted before export, each piece should be stamped with the sale mark before it is allowed to be removed. The sale mark should also be similarly put on round logs before they are taken out.

Section V.—Wholesale disposal of the trees of a coupe standing.

This system cannot obviously be adopted for the produce of cleanings and early thinnings, in which operations the felling has to be effected by the owner's agency. Its employment is also out of the question in the absence of a large class of well-to-do and honest dealers. When it can be adopted, it is by far the best method to employ, as it leaves the conservancy establishment completely free to devote itself to its legitimate duties of culture and protection.

The trees being marked for sale (or girdled and killed, as in Burmah), the first point to decide is whether they should be sold by public auction or by inviting sealed or open tenders; also whether their sale price should be recovered as a lump sum covering the entire lot or at so much a tree, according to species and size, or at so much per unit or number or volume of converted material.

When purchasers eager to buy readily offer themselves, the system of sealed tenders is the best, as public bidding at an auction and open tendering enable the dealers to combine. In the State forests of France the following mode of public auction, termed *vente au rabais*, is, however, said to prevent such combinations. A short candle, capable of burning about 5 minutes, is lighted and the auction is declared open. The crier begins by calling out a sum considerably in excess of that at which the Forest Officer has estimated the value of the coupe, and at regular intervals he goes on diminishing this sum by a small fixed amount. The auction lasts only as long as the candle is burning, and the sale is adjudged, at the figure last called, to the first person who cries out "I take." Each bidder, knowing that the time is limited to only a few minutes, is usually only too eager, as soon as a figure is reached which he thinks will yield him a profit, to cry out "I take," being afraid of being forestalled by another. This method of sale is practicable only when the bidders are quick-witted men of business, and is unfortunately not adapted to the haggling spirit engendered by the Indian mode of buying and selling.

In the case of sale by sealed tenders a certain date is fixed by which all such tenders must be sent in. On a day and at an hour notified beforehand, the tenders are opened in the presence of any of the tenderers who wish to attend, and the terms of the tenders are read aloud, so that the proceedings may be entirely of a public character and above suspicion. To prevent people from making tenders which they are unable to carry out, every tender, before it can be received, should be accompanied with a deposit of money, which is forfeited in case of non-fulfilment of the tender. The adoption of the system of sealed tenders is impossible without the existence of a sufficiently large class of enlightened and enterprising dealers, as the excitement that naturally accompanies the public bidding at an auction and incites to keen competition is entirely wanting in it. It is totally unsuited to men who have not risen above the haggling spirit of the Indian buyer and seller. But when the proper class of dealers is not wanting, it is the best system to adopt, as it saves time and worry, and effectually prevents combination, since every tenderer, being anxious to secure the sale for himself, and not knowing what the terms tendered by other people are, offers as high a figure as he, according to his lights, thinks will yield him a sufficient and legitimate profit.

In the method of open tenders would-be purchasers may apply, either personally or by letter, and at any time within a given date, but the Forest Officer is not precluded from foreclosing with any tenderer before the expiry of that date. In this method of open tender an opportunity is afforded of bargaining, which must be made the most of. The terms offered by the various tendering parties may be disclosed or not, according to the discretion of the vendor. The system is, however, liable to induce combination amongst dealers, as the vendor is obliged more or less to disclose his hand to the first tenderer; moreover, unless the value of the produce in question is well-known and is not subject to wide fluctuations, the vendor is exposed to commit himself to prices which subsequent tenders may prove to be too low, and in such case the system of sealed tenders or of public auction is preferable.

Whether the value of the produce sold should be fixed as a lump sum for the whole lot or recovered at so much a tree, or at so much per unit or cubic foot of converted material, depends principally on the condition of the market and the nature and character of the purchaser. If the purchaser is honest and understands his business thoroughly, it is best to sell the whole coupe for a lump sum, thus obviating the heavy tedium and labour of classifying and counting all the produce, of keeping a complete voluminous regis-

ter of it, and of making endless calculations in order to ascertain the price of each one of the numerous classes of which it consists. The benefit accruing therefrom to the purchaser is equally great, since it relieves him at once from the thousand and one obstructions and petty annoyances to which he would otherwise be liable from the people checking his operations. But in the absence of a sufficiently honest and enlightened class of dealers, it is impossible for the Forest Officer, who necessarily has little acquaintance with the market to know whether the lump sum offered represents anything like the true value of the coupe or not. In that case it is safer for him to receive the value of the produce according to the quantity of each class of material taken out of the coupe, and it remains for him to decide whether the unit of sale shall be a tree or a cubic foot or the number of pieces of each class. Of these three bases of valuation, the first is the simplest, as the total value of the coupe can then be at once calculated, and this amount can be treated as a lump sum due from the purchaser, thereby avoiding all chance of future disputes. But this system is not applicable in a forest in which the quality of the trees varies very much from place to place. For instance, large profits for a few years, owing to the trees sold having been sound and well-shaped, may tempt purchasers to give unusually high prices at subsequent sales; but the trees proving unsound, heavy losses are incurred. The confidence of dealers is thus once for all shaken, and in future, however good the trees may be, the rates offered are based on the assumption that the trees are no better than the worst descriptions obtained before.

Hence, when the quality of the trees is very variable, it is best to charge the purchaser rates based on unit of volume or number of pieces of converted material. When volume forms the basis, a considerable amount of labour is inevitable in working out the total sale-value, if the number of pieces to be measured is large. Moreover, very few of our Indian purchasers are familiar with the methods of timber measurement. Hence, except for large logs, the contents of which obviously differ very much one from another, it is best to fix the rates on the basis of number units, which can be understood by the most illiterate purchaser. The unit rates on which the value of the produce is calculated must of course be originally fixed by measure of volume. The use of the numerous published tables of timber measurement will aid very materially in lightening the work of calculation in either case.

In some places, the better class of timber dealers care to utilize only the best logs and to take out only timber of the highest quality. Such purchasers will either leave the inferior timber

untouched, or, as they look only for large profits, will take it out only at disproportionately low rates. In such cases it is best to admit into the coupe two or more separate purchasers following each other, the first taking out only the finest timber, the second the next best class, and so on until every saleable stick has been removed. This method has been followed for many years in the forests of the Central Circle of the N.-W. Provinces and Oudh with the best results. It is peculiarly suitable for India, where the small dealers are men who are satisfied with profits giving them an average income of a few rupees a month; but it necessitates keeping even the smallest coupe open for exploitation for at least a couple of years, as it would be impolitic to let in a new purchaser until the previous one had cleared out all his produce. But even when the owner of the forest sells the whole produce of the coupe to a single purchaser it will often happen that this latter will himself remove only the best timber and admit petty tradesmen and consumers to take out the rest at prices which he will constantly lower as the better class of the remaining material is taken away or the distance or difficulty of transport increases.

When the value of the coupe is estimated in a lump sum, this amount should be recovered in not less than two instalments, the first one being taken before the purchaser is allowed to begin work, and the last while there is still enough material (whether it be scattered over the whole area or collected at temporary depôts) to cover the amount of the instalment. In the event of any instalment not being paid when it falls due, there should be a proviso in the written conditions of sale to empower the owner to recover it by seizing and appropriating the produce remaining unexported. If the value to be paid by the purchaser is calculated on the basis of unit rates, the money may be recovered in the same way, or in one of two other ways. Either the purchaser may be made to pay down a sufficiently large sum as earnest-money on the conclusion of the sale, and to make good the balance when all the produce has been collected and counted or measured up, as the case may be, or he may be required to pay the value of the produce as he takes it out, the earnest-money in this case being refunded to him when his operations have been completed. What is termed the "permit and revenue depôt system" and adopted in the Central Circle of the N.-W. Provinces and Oudh, is a practical application of the latter method. The system in question is a development of the kham tahsil system, which it can replace at once without any derangement of current arrangements, the revenue stations serving at once as depôts where the out-going produce has to be stopped for check

and counting or measurement and the price has to be collected, and the only change required being that instead of any and every one being allowed to go into the forest and cut and collect what he likes, only *bonâ fide* purchasers, with whom distinct contracts have been made, may cut and export. It is always impolitic to put temptation in the way of people on small salaries, and hence, where Government treasuries or private banks are not far off, the large sums of money due at various times from the purchaser of whole coupes should be paid direct to a treasury or bank, the pass for the wood being given to the purchaser on his presentation of the receipt for the money. And, whenever possible, only well-paid officers, holding high responsibility, should be authorized to measure up and value large quantities of produce, which are to be paid for on the basis of unit of volume or number.

Section VI.—Wholesale disposal of the trees on the coupe after they have been felled.

In this case the owner fells the trees and then sells them, as they lie on the ground, to one or a series of wholesale purchasers, as the case may be. The object of felling the wood himself is to ensure that every stem whose removal is necessary for the improvement of the forest is got rid of, since, in the system just described above, the very crooked trees and those of inferior species may be left standing by the purchasers as not being sufficiently valuable to give them the profits they require. In all other respects, however, the procedure to follow in the present system does not differ from what has been described under the preceding one.

The felling of the trees by the owner also secures another important cultural advantage. It enables him, in young forest or where there is a mixture of ages, to cut back all badly grown saplings and small poles the re-growth from which would very appreciably improve the constitution and future of the stock. Such saplings and small poles having little or no value, the purchaser of standing produce might not have sufficient inducement to cut them back, even if the price he had to pay for the coupe was considerably diminished on that account. Hence in all cleanings and early thinnings, in nearly all improvement fellings, and often in after-fellings and jardinage coupes, this system must necessarily be employed, and in the two last classes of fellings, even if the system is not adopted for the entire cut, it must be followed in the minor operations which, forming an essential part of the felling, have for their object the improved growth of the younger generation.

As in this method of sale the coupe gets littered with small and very inferior produce, the principle on which it is based can be adopted only where there is a demand for almost every portion of the cut. The system cannot be applied to the sale of trees that are scattered over a large area, as the cost of felling them would eat too much into profits. It is for this reason that in the Dehra Dún sál forests only the trees which are above 6 inches in diameter are sold standing, the inferior stems, the removal of which is doubtful, being girdled to make sure of their disappearance.

Section VII.—The Forest Depôt System.

In this system the owner not only fells all the trees, but also subjects them to a certain amount of conversion and collects them into smaller or larger lots on the nearest roadside or in neighbouring blanks, from which their export can then be effected with ease and without injury to the forest. This system is adopted when purchasers cannot be trusted to work inside the forest without hurting or plundering it, or when the management has plenty of time on its hands, labour is easily obtained and organized, and the owner is anxious to secure for himself a part of the profits that would otherwise fall to the purchaser.

The collected produce may be disposed of wholesale to a single purchaser or in assorted lots to several purchasers or in a more or less retail manner, and the sale may be effected either by auction or by sealed or open tenders, or according to a published tariff.

CHAPTER V.—MANAGEMENT OF WOOD DEPOTS AND TIMBER YARDS.

In the chapter just completed the sale of wood in the forest was described. In the present case, the wood, after undergoing a considerable amount of conversion, is brought to a depôt within convenient reach of the market. A depôt of this kind is, therefore, necessarily of a permanent character, and is maintained on a very much larger scale than mere forest depôts. It requires the entertainment of a special resident establishment, which can be more fully utilized and better paid the larger the depôt is, thus securing at once economy and honesty.

The most important points to attend to in such a depôt are a correct classification of the produce in accordance with the market demand and such an arrangement of the different classes that they may be found at once and every piece examined without any trouble. For facility both of check and of sale, the pieces in each class should be put up in stacks or lots of definite size or contain-

ing a definite number of pieces. Provision should also be made for the easy removal of every piece of wood. For this purpose the entire area should be divided off into compartments containing each a main class of produce, and each compartment into sub-compartments destined to contain separately the various categories of each class. The division lines may be roads fit for carts or laid with rails, according to the amount of traffic.

Very large logs, too heavy to be moved without great difficulty, should all be kept only in a single tier with the butt-end facing the road. Smaller timber should be stacked in the way already described on page 384.

In very large depôts, sheds may be built to shelter the more valuable goods and to allow them to season properly. In these sheds, in order to economise space, the ceiling should consist of strong, open wood or iron work, capable of bearing boards and smaller sawn material. While a perfectly free circulation of air throughout the shed is necessary, draughts, especially of very dry and hot or very damp or cold air, should be prevented, and the temperature inside kept as equable as possible.

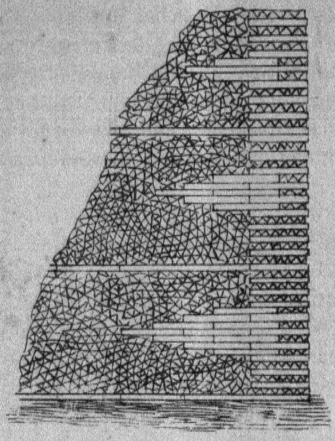
A further precaution for timber that is not yet completely seasoned is to plaster the ends with a mixture of clay and cowdung. It is surfaces exposing a cross-section that give out moisture most rapidly and are most liable to form cracks, and the object of the plastering is to diminish the rapidity of evaporation. Wood intended for carving or engraving should be kept in short lengths, round pieces being sawn along their entire length down to the centre, so that as the various concentric rings of growth contract, the saw-cut opens out wider and wider, without a single important crack occurring.

Sometimes it may be necessary to water-season timber (see page 9). In that case there ought to be a large or several large tanks, and until the pieces thrown in sink of themselves or unless they are forcibly kept under water, they should be constantly turned, otherwise decomposition would soon result in the portion near the water line.

The smallest stacks of firewood should have a square horizontal section, the side of the square being equal to the length of the billets, and the height such a figure as will bring up the contents of the stack to 10 cubic feet, or a little more if allowance is to be made for shrinkage. Larger stacks may be built up like those described on page 385, and should contain some multiple of 10 cubic feet. For wholesale dealers, specially large stacks, having a square horizontal section of 10, 20, 30, 40, and even 50 feet side, should be built up.

No little skill is required to give them sufficient stability. *Fig.* 60

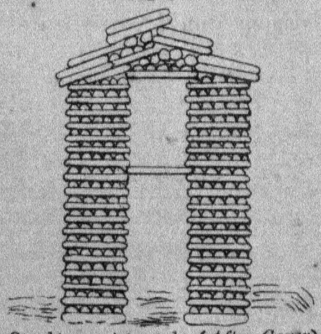
Fig. 60.



Mode of building up large stacks. (*After Gayer*).

shows a very good plan to follow. In it the corners are tied very ingeniously, and, in order to secure uniform shrinkage, horizontal rows of straight pieces should be laid at short intervals, thus building up the stack in regular layers. Occasional long pieces should be inserted with the same object with which headers are employed in masonry. In the case of firewood that has been floated, there should be no delay at all in spreading the pieces out to dry, and stacking them so that they may be freely exposed on every side. In *Fig.* 61 is exhibited a very successful mode of building such stacks.

Fig. 61.



Stacking moist wood. (*After Gayer*).

It is hardly necessary to say that every precaution should be taken against the occurrence of fire, and for this reason the site of the depôt should be specially selected for its proximity to an abundant supply of water. As it is easier to suppress a fire that is just beginning than to attack one that has already spread, numerous pots of water should always be kept handy at different points.

Besides depôt registers punctiliously written up as each transaction occurs, a special rate-book should be kept wherein all fluctuations of prices both at the depôt and in the open market are carefully recorded.

The mode of sale will generally be by open tenders, sealed tenders and public auctions being resorted to only in the case of such stock as must be got rid of at once. Stock of this kind will generally consist of deteriorating material or material likely to deteriorate if not sold off quickly. But if it is not possible to place a well-paid and trustworthy man in charge, the only plan to follow in effecting the ordinary sales is to fix from time to time, for the guidance of the establishment, a tariff of prices, to which the utmost publicity should be given.

At all large depôts the establishment of saw machinery will never fail to result in a marked increase of revenue. By its means the scantlings most in demand could be prepared at once, either on indent or in expectation of buyers, and all odds and ends could be utilized to the utmost extent of their value. For this reason, it would be an advantage to place the depôt where water-power can be used, since such power costs next to nothing, and the machinery required for it is of the very simplest description, being most of it capable of being repaired without skilled labour. In the absence of such advantages, steam machinery must be used, the wood refuse supplying the necessary fuel. In Government depôts no wood-working machinery beyond a simple saw bench should be introduced, further conversion being properly left to private dealers.

PART II.

COLLECTION, PREPARATION, AND DISPOSAL OF MINOR PRODUCE.

UNDER the term minor produce is included every useful substance that can be obtained from a forest besides timber and firewood. The forests of India are particularly rich in minor produce, both in regard to quantity and variety, and a knowledge of how to utilize the various descriptions of such produce is, therefore, of peculiar importance to us. At present, owing to the backward condition of the country, the demand is limited; but with the development of means of communication, a rise in the standard of living, and the continued expansion of internal as well as external trade, the exploitation of minor produce will become a most important source of national wealth.

A complete study of the utilization of every article of minor produce would lead us a great deal too far, and would require several large volumes. Here it will suffice to consider in a general manner how they are obtained from the forest, and to what extent they may be utilized without unduly interfering with the main end of sylviculture, namely, the production of timber and firewood. The subject will be treated under nine principal heads as follows:—

I.—Utilization of herbaceous vegetation.
II.—Utilization of the flowers and fruit of trees and shrubs.
III.—Utilization of the bark of trees and shrubs.
IV.—Utilization of the leaves of trees and shrubs.
V.—Utilization of minor produce obtained from wood and from the interior of stems.
VI.—Utilization of minor produce furnished by the roots of trees and shrubs.
VII.—Utilization of exuded products.
VIII.—Utilization of animal products.
IX.—Utilization of minerals and some other products.

CHAPTER I.—UTILIZATION OF HERBACEOUS VEGETATION.

The herbaceous vegetation covering the ground in our forests is peculiarly abundant, but consists chiefly of grass. On it, at pre-

sent, depends the entire system of agriculture of the country, and hence its title to first consideration. It supplies (1) pasturage, (2) hay and cut green-fodder, (3) ensilage, (4) litter, (5) fibres, (6) material for thatching and for making mats and baskets, and (7) drugs, dyes, &c.

Section I.—Pasturage.

In the present condition of our agriculture, pasturage is the most important want supplied by the herbaceous vegetation growing in our forests. Nearly half the live-stock of the country depends entirely on the forests for its sustenance, while an extremely large proportion of the rest is driven for some period or other of the year to graze there. Forest grazing has been for so many ages an essential part of our rural economy, that with a climate opposed to meadow cultivation on any appreciable scale and national habits and religious prejudices which preclude any extensive consumption of meat, it will always continue to be the chief mode of feeding cattle.

The fields, owing to the enormous population and to India being one of the granaries of the world, will never cease to be used principally for the production of food-grains, oil-seeds, and fibres, fodder being, as now, only a by-product. Thus we must submit to most of our forests being used as permanent pasture grounds, and must accordingly arrange for the fullest utilization of the fodder they yield, consistently with the production of timber and firewood. The forest-grazing question acquires its highest importance in dry countries with a low rainfall, and in hilly and mountainous districts where the extent of available arable land is usually hardly sufficient for producing the food of the population.

The advantages accruing to agriculture from forest-grazing are thus unquestionable and incalculable. For the forests themselves, the advantages are few and only occasional, while the disadvantages are enormous, and may tend to the extermination itself of the forest.

The advantages may be said to be four in number. Firstly, grazing helps to keep down the rank growth of grass and weeds, which come up in profusion even under a dense leaf-canopy with only a modicum of light, and interfere with reproduction. Secondly, when the ground is sloping, but not so steep as to require careful protection against slipping, the going to and fro of cattle breaks up and loosens the surface soil and thus prepares it for reproduction. Thirdly, where in open glades and blanks the soil gets

covered with a close matting of grass roots impenetrable to the delicate roots of forest seedlings, there the sharp feet of cattle and the plucking action of their bite combine to tear up the grass at numerous points and thus make openings for seedlings. Lastly, in all conifer forests, without the crushing action of the feet of cattle, the dry undecomposed needles form a thick layer over the ground, through which the roots of seedlings are unable to reach the mineral soil below, or are at least able to do so with difficulty..

Exceptionally, a fifth advantage may be derived from regulated grazing. In mature babul forest, when a new generation of seedlings is required, the appearance of this latter is singularly accelerated by admitting goats and folding them at night within the area while the pods are falling. The seeds that have been voided by the animals germinate without delay, whereas the rest generally take at least a whole year to sprout, during which time they are exposed to every cause of injury or even complete destruction.

The principal dangers arising from grazing are as follow :—(1). The removal of the herbaceous vegetation means the loss of so much manurial matter, including potash, phosphorus, and nitrogen in its most assimilable form. (2). The animals break and crush young seedlings, the heavier kinds under their broad hoofs, sheep and goats with their sharp and quick-moving feet which cover but little ground at each step, the mischief being aggravated in the case of sheep by their moving in a dense mass together. (3). Forest-bred cattle, and even those that are only partly stall-fed, acquire the habit of eating the leaves and twigs of forest trees with as much relish as they browse off grass and herbaceous vegetation. All cattle without exception, when very hungry, fall greedily and indiscriminately on every green thing before them ; and we know in what a starving condition the animals are brought into the forest every year from the villages. To make matters worse, these animals arrive when the grass is dry, hard, and tasteless, so that in their famished condition they make at once for all the low forest growth, which, as a rule, puts forth new foliage before the new grass makes its appearance. Now we know that a woody plant suffers most and recovers least easily while its new flush of leaves is coming out. Thus the heaviest grazing occurs during the most dangerous season for forest vegetation. Broad-leaved species, yielding, as they do, the best fodder, suffer most. (4). When the soil is wet, the constant tread of the animals beats it down into a hard pan quite impenetrable to the roots of forest seedlings, and it is when the soil has been drenched by rain that seeds germinate ; hence the presence

of cattle during the rains, and, in the Himalayas, also during spring, is a great bar to natural reproduction, if it does not entirely prevent it. (5). Young animals are much more destructive than old ones, since they nibble at forest growth not only for their food, but also sometimes from pure mischief; sometimes to relieve the irritation arising from the cutting of new teeth. (6). The continued admission of goats into a forest results, in a few years, in its complete disappearance, since these animals prefer the leaves of woody species, when they can get them, to the finest grass. They also gnaw off bark, and, besides standing up to their food, they throw themselves on to flexible stems, thus bending them down under themselves and getting at the tops of saplings up to 9 and 10 feet high. Even camels, in spite of their very much higher reach and the peculiar way they have of tearing off a long succession of leaves and twigs, are less to be dreaded than goats. Sheep, from naturally holding their heads along the ground, will seldom touch anything else if they can get grass; but when the grass is dry and hard, they may nibble off leaves at the height of their heads. Buffaloes, even when they eat only grass, crush young growth up to the size of saplings, and when hard pressed for green food, have been known to use their enormous weight to bend down to the ground poles up to 12 inches in girth and 14 feet high. Cows are the least harmful of all domestic stock (elephants, ponies, and horses are in too small numbers to be taken into account), and will, as a rule, not touch seedlings and saplings of forest trees, even if abundant and mixed up with the grass, unless this last is very bad indeed.

Some species, such as *Anogeissus pendula* and *Prosopis spicigera*, are extremely resisting to the effects of constant browsing; but, even in their case, the appearance of new seedling growth, except in the midst of thorny bushes, is an impossibility, and the individuals that survive are permanently stunted and often reduced to low twiggy knotty bushes which spread out along the ground.

The advantages and dangers connected with grazing in the forest have now been briefly considered. It has also been shown that the provision of grazing on a large scale is, in present circumstances, an unfortunate necessity. Some general rules must hence be given for regulating its exercise, while avoiding or minimising the attendant risks. In the first place, goats and camels must be rigidly excluded from all areas which are intended to grow wood, mature babul crops being, however, excepted in favour of goats during the fall of seed immediately preceding the required appearance of the new crop. All other animals also must be excluded from areas under regeneration or containing abundant

young growth not above their reach, while the ground is soft and sodden or seeds are germinating or the grass is dry and wiry and the tree-species are in leaf or coming out into leaf. Otherwise cows, buffaloes, and in many cases even sheep, may be admitted in restricted numbers and in small herds or flocks at each place, since a number of animals moving in a mass would make a clean sweep of everything before them and tread the soil into a hard pan. In regulating the size of the flocks and herds and apportioning to them the areas in which they may range, we may assume that for every 100 lbs. of live weight each animal requires per diem from 10 to 12 lbs. green weight of fodder, and that an acre of forest land, inclusive of unproductive portions and fully canopied areas, produces, on an average, about 12,000 lbs. green weight of edible grass, of which hardly one-third remains in a fit condition to eat during the six months of the year that grazing is permissible. It is, therefore, evident that the smallest area of forest land that can be assigned per head for those six months cannot be less than 2½ acres for cows, 4 acres for buffaloes, and ½ acre for sheep. These are minima figures, and the actual areas assignable, after deductions in the interests of reproduction, unstable soil, &c., will considerably exceed those figures. If more cattle are admitted than the forest can stand, we must make up our minds to sacrifice the woody growth : excessive grazing and forest growth are totally incompatible terms. Actually, in many places, the number of head of cattle is in excess of the capabilities of the forests, and the assumed necessity (in nearly every case totally unfounded) of providing grazing for the entire number is the cause of so much lamentable deterioration and arrested progress visible everywhere. It is undeniable that the number of cattle is enormously in excess of requirements. At any rate, hundreds of thousands of utterly useless brutes ravage the forests, and two half-starved, ill-bred animals have to be used where a single well-fed, well-bred one would suffice. Thus, were it not for the neglect and apathy of the Indian agriculturist, the demand made on our forests for grazing would probably be well within the capability of nearly every one of them. To overcome this neglect and apathy of ages we must enlist on our side the sympathies and powerful aid of the Agricultural Department.

Each group of animals must be in charge of responsible herdsmen sufficiently numerous to control them and to drive them over the entire allotted area, so that no part may be overgrazed. In areas into which cattle are admitted to keep down the grass and weeds, or to wound the soil or to crush an excessively thick layer of dead

undecomposed débris, it should be a condition of admission that they are driven regularly backwards and forwards over the whole area, and especially there where they can do most good. If the animals are penned within the forest at night, a special spot must be fixed for them which is a natural blank, and is not immediately surrounded by promising and abundant young growth. Every animal of the bovine class should have a bell hung from its neck, so that no animal may stray without the fact being at once detected. The leaders of a flock of sheep should also have bells. The herdsmen, when out in the forest with their cattle, should not be allowed to carry any woodmen's tools with them; but in case they are allowed to lop, they may have with them light hatchets or bills. Infringement of rules on their part must be followed by heavy fines or summary expulsion from the forest, together with suspension, if necessary, from the privilege of grazing for a determinate period.

Lastly, in crops of mixed ages, especially if young growth is deficient, every assignment should be further divided into two or more equivalent portions and a rotation established, so that each area may have a certain period of rest.

When grazing is charged for, the fee per head to be levied for the different classes of animals should be regulated by several combined considerations, the principal of which are (1) their relative destructiveness from a forest point of view, (2) their relative value, (3) the quantity of fodder they consume, (4) the market value of the fodder, (5) the wealth of the general population, and (6) the degree of conservancy to be adopted. Thus, although a goat will eat less than a fifth of what a plains cow will consume, the respective fees to be levied should be considerably in excess of the ratio of 1 to 5. As so many different considerations affect the question of the amount of grazing dues, it would be absurd to adopt the same tariff of rates for a whole province or even for a whole district; and often even two neighbouring forests, which are under different degrees of conservancy, will require different rates. Similarly, the proportionate rates for the different classes of animals ought not to be the same everywhere. For instance, in the North-West Himalayas, the diminutive hill cow is hardly worth more than a sheep or goat, while in most other parts of the country, the value of a cow is 4 to 10 times higher than that of a sheep or goat. The simplest way of reducing the number of animals of any class grazing in a given forest is to raise the grazing fee. Remembering this, if the grazing in any forest is in excess of its capability, we have only to gradually raise the rates until the number of cattle is

brought down to the desired figure; the effective rates in each case will depend on the wealth of the population and the value of the cattle. Sometimes, however, certain classes of people may have to be specially favoured, such as backward jungle tribes which are under our particular protection, or inhabitants of villages composed exclusively of our work-people; and in their case a limited number of animals per family or household may be admitted to graze at lower rates, only those in excess of this number being taxed according to the general tariff. The full rates at present levied in most provinces are far too low in comparison with the amount of fodder consumed and the value of the animals.

The levy of grazing dues gives, more than the collection of any other kind of forest revenue, special facilities for oppression and extortion, for there is scarcely a household in the neighbourhood of forests which does not possess at least one goat or cow. For this reason the arrangements for collecting the dues must be made with the greatest care. At the same time they should be such as not to engross the time of the establishment. The system will have to be different according to circumstances. For cattle which go to graze in the forests during the day and return to their villages at night, the plan which commends itself most is to require annual returns from the patwaris and headmen jointly, a few of these returns being checked, to test their general accuracy, by the forest staff. On receipt of the corrected lists, the dues should be collected by the Collector of the district in the same way as land revenue. In some districts a triennial census of such cattle is made, and a grazing assessment is fixed by villages for a period of three years, the amount assessed being collected annually by the district officials like land revenue. This is perhaps the simplest and least inquisitorial system that has yet been devised, but many changes may occur in the number of cattle in a village during the period of three years. For cattle which pass the night also in the forest, the forest staff must both count the cattle and collect the dues, unless the same cattle have been paid for through another channel, in which case the herdsman must come provided with a pass for the number of head already paid for. A copy or duplicate of such pass must be sent for check to the District Forest office.

Section II.—Hay and cut green fodder.

The removal of grass means, just as in the case of grazing, the loss to the forest of so much precious manurial matter; but, in nearly every case, this disadvantage is much more than counter-

balanced by the benefits accruing therefrom. In frosty localities, if tall dense grass protects small seedlings, it, on the other hand, makes it very difficult for them to rise above it, as it increases by several degrees the intensity of the cold. Heavy frost will lie upon the grass in grassy land, when on bare open land the temperature may be several degrees above freezing. In the case of high temperatures, however, surrounding and overtopping grass is nearly always beneficial. For young seedlings struggling in the midst of grass, cutting the grass is a much better and surer means of getting rid of it than grazing, with all its attendant risks. On this account grass-cutting should be encouraged as much as possible wherever it will lead to a diminution of grazing. The closing of the forest areas in Ajmere against grazing has not only resulted in the possibility of growing forest on dry, bare, rocky hill-sides, but even in an increase in the production of fodder, so marked as to be freely recognised by the population itself, which clamoured most against the measure on its introduction only 15 years ago. But the grass-cutters must be warned to be careful not to cut off seedlings with the grass, and the use of scythes should be strictly prohibited.

Green grass from the forest can be used only by people living within the distance of a day's journey. Hence for a more general utilization of the fodder, it should be converted into hay, the preparation of which must, therefore, now be described.

Grass for hay should be cut immediately it is in full bloom. After this period, the formation of seed robs the stem and leaves of potash, nitrogenous matters, and phosphates, and the carbo-hydrates are converted into coarse fibre, so that the grass becomes poorer in nutritive substances and the proportion of indigestible fibre increases. Moreover, the further vegetation of the plant and the progress of fructification continue to exhaust the soil without any compensating advantage. At any rate, the grass should be cut before the seed is fully formed. As soon as the grass has been cut, it should be spread out to dry. If not dried quickly enough it would ferment, the sugar in it being converted into alcohol, which would both destroy its flavour and nutritive value, and cause it to lose the well-known fragrance of hay. The alcohol also dissolves out the green colouring matter of the chlorophyll, so that hay that has not been dried quickly enough is yellow and not greenish. At the same time it must not be dried too quickly, otherwise it becomes too hard and is not so nutritious and digestible as properly dried hay. On the approach of evening, the grass, now partially dry, should be collected into heaps, so that the

dew at night may not undo the work of the day. The second day after the grass has been cut, it should be tossed up in the air with forks, after it has been spread out with a rake and the dew has evaporated. If the hay is now ready, it should be carted away or stacked; otherwise it must be collected once more into heaps against the night, and tossed up again with forks for another day. Wet weather is of course disastrous for hay-making. Good hay is greenish in colour, appreciably dry, sweetish to the taste, and agreeably scented. The weight of hay is ⅓rd that of the original grass.

To preserve hay it should be stacked, in order to protect it from wind, rain and dew, and, at low elevations, also from white ants. The ordinary Indian way followed in the plains is to tie up the hay in bundles from 1 to 3 lbs. each, which are piled up in stacks resembling either a house with a pent roof or a circular hut with a conical roof. The dimensions at the eaves in either case is greater than those at the base, in order to let the rain drop off on the ground clear of the hay. The former kind of stack is the easier one to build, especially when large stacks are required. Such stacks, containing 200,000 lbs. of hay, are not uncommon. After the stacking is completed, a roof of thatch should be put on. For the first kind of stack the thatch can be constructed on the ground and then put up and kept down with ropes heavily weighted at the ends, thereby also securing compression for the hay—another very important advantage gained by the adoption of that mode of stacking. For the supply of the army in cantonments Captain Wingate, the officer specially charged with the forage operations of the Western Commissariat Circle of the Bengal Presidency, recommends the following system of stacking. A circle is traced on the ground of the required diameter and encircled with a shallow trench, the earth from which is used to raise the ground inside. Above this earth is laid a 4 to 6-inch bed of cinders, which not only keeps out white ants and rats, but also prevents damp getting in from below. Before the grass is stacked, the site is dressed, so as to give it the form of a flat dome. The height of the stack at the eaves is about two-thirds of the diameter at the base, and the diameter there at least 6 feet in excess of the lower one. The stack is then finished off in the form of a cone with steep sides. It should not be thatched until it has settled. This takes about a fortnight, and in the meantime the hay is protected with tarpaulins. In the Himalayas, where space is always a desideratum, the stacks are usually built up loosely, in a more or less globular form, on pollards or in the crowns of trees in the midst

of the main branches. Well-kept hay will remain good for more than three years.

In many parts of India hay is pretty carefully made; but not unfrequently the grass is cut when the seed is quite ripe, and even after the whole plant has become quite dry. No practice is more reprehensible.

Our forests could furnish the whole country side with excellent hay, and remove, once for all, the frequent great embarrassment experienced by the army in obtaining forage. But the disproportionate bulk of hay, compared with its weight, renders its transport difficult and expensive, especially with our high railway freights and deficient means of communication. Hence its export beyond two or three days' journey by cart has been hitherto impracticable. To remedy this very serious drawback, the practice has, since the last year or so, been experimentally resorted to of compressing the hay into bales weighing about a maund each and bound round with iron bands, just like a bale of cotton or piece-goods, or with iron wire, the latter requiring no rivets and being at least 2 lbs. lighter for each bale. This plan was very successfully followed in 1889 and 1890 in the Changa Manga plantation, when the entire outturn was taken by rail to the cavalry camp at Muridki, a distance of about 60 miles. The compression was effected with hand-worked Boomer presses, which are easily portable and readily put up. The advantage of compressed bales of fodder to an army in the field is incalculable; and even in ordinary peace times their transportability and non-liability to spontaneous combustion will render them invaluable in large towns and cantonments, especially those situated at a distance from sources of supply. At Amritsar, in the Punjab, a large steam factory, containing several presses and managed by a rich company under European supervision, has been at work for the past three years.

Better than ordinary compressed fodder is fodder compressed in combination with some sweet glutinous substance, which, by filling up all air-spaces, converts the bale into a solid mass. Mr. Arthur Rogers, a railway mechanical engineer, who originally conceived this excellent idea, has patented a most successful process, in which treacle is used as the cementing substance. The treacle increases, to a marvellous extent, the nutritiousness and palatability of the fodder and makes it keep good for an indefinite period. Moreover, it makes use of the interstices which would otherwise only contain air, and thus helps to economise space. Some bales of Mr. Rogers' fodder were found totally unaffected after having been buried in the ground for three years.

Section III.—Grass preserves.

It will be appropriate to say a few words here regarding the formation and management of grass preserves, a matter that has real importance for the Indian Forester in the neighbourhood of large towns and cantonments and in dry places on the North-Western frontier, where a ready supply of fodder for any military emergency is a necessity. We may have (1) unirrigated natural grass preserves, or (2) irrigated preserves. In both classes of preserves a sprinkling of deep-rooted trees with shady crowns helps the growth of the grass.

1. *Unirrigated natural grass preserves.*

The special maintenance of such preserves is to be recommended only when the rainfall exceeds 10 inches and the soil is at least of medium quality. The coarser grasses and weeds should be grubbed out; and if money is available, the land should once for all be ploughed up, top-dressed with well-rotted cattle droppings or poudrette, and sown with seeds of the better kinds. The quantity of seeds to be sown will vary from 3 to 10 lbs. per acre, according to the species. Once established, the preserve requires only to be kept free of undesirable growth and top-dressed from time to time with manure. Grazing or the periodical cutting of the grass should never be entirely stopped, for there is no more effective and economical mode of improving the quality of the fodder and of keeping out coarse species than allowing moderate grazing at the proper seasons and maintaining the ground clear of dead tussocks. If cut fodder is required, as many as three and sometimes even four cuttings may be taken off during the first three months of the rains, the next crop being left, if necessary, to mature for hay. If the same area has also to serve as a grazing ground, grazing may be permitted during the first two months of the rainy season, and again after the crop of hay has been removed. Combined grazing and cutting is better than cutting alone, as the grazing makes the grass grow closer and the droppings of the animals constitute so much effective manure. Heavy or frequent manuring or any kind of intensive treatment is of course quite out of the question in natural preserves, except in the immediate vicinity of large centres of population. At Allahabad, off extensive unirrigated areas that have now been systematically treated since 1882, the yield of green grass is as high as 800 maunds per acre per annum.

2. *Irrigated grass preserves.*

Irrigation places in our hands an instrument which enables

every desirable species of grass to be cultivated in the greatest abundance possible. In this country we seldom, if ever, find any area that is covered at every point with only the best kind or kinds of fodder grass. Hence the first thing to do is to sow or plant up the land with good species, after levelling the ground and laying out the irrigation channels.

Certain kinds of grasses, especially those which spread by means of runners, may be planted; the rest are best sown at the rate of from 20 to 40 lbs. of seed to the acre, according to the species used. The usual method of preparing the land, which will probably never be superseded, is to plough it up and top-dress it with manure. This method can give in the very first year of cultivation as much as 600 maunds of green doob (*Cynodon Dactylon*) per acre. General Ottley's system, which is said to increase the yield by at least 30 per cent. by giving eight cuttings per annum at the rate of 56 maunds of green grass each per acre, and to get rid of the soda efflorescence in reh soils, consists in excavating the soil to a depth of 18 inches, putting in a 9-inch layer of fresh litter or other manure and returning the earth, thoroughly sifted, over the manure. Finally, the area is divided off into beds 3 feet wide and enclosed by a ridge of earth to hold the irrigation water. The system has not yet had a fair trial, but it is beyond question a most costly one, and for that reason alone can never be generally adopted.

The land should be irrigated once every two, three, or even four weeks, the soil being flooded and thoroughly drenched each time.

It is evident that in irrigated preserves grazing cannot be permitted and the grass can only be cut.

Section IV.—Ensilage.

Silage is fodder obtained by storing green material under continued compression and exclusion of air.

The simplest method of making silage is to excavate a rectangular pit not less than 8 feet deep, in a stiff soil impervious to air. In order to pack the fodder close and thus diminish the quantity of air necessarily left in the pit, it should be chopped short and stratified, each stratum being well trodden down by men and boys before the next one is laid on. The thickness of the layers, when completely settled, should not exceed 3 inches, and the shortness of chopping will depend on the stiffness of the material to be ensilaged. If the temperature of the air is much under 95° Fah., a new stratum must not be put on until a certain degree of fermentation has occurred in the one previously laid down. This fermenta-

tion not only brings up the temperature to the right point, but as a direct result of the formation of carbonic acid, which is heavier than air, this last is driven out of the fermenting heap. If the temperature of the air is already high enough, the filling should be done quickly, but not so quickly as to prevent the contents from settling down and a certain amount of fermentation setting in. The pit should be filled with the fodder within about a foot of the top. The covering should consist of bamboo or other cheap matting, overlaid with sufficient closely-rammed earth to create a pressure of from 100 to 150 lbs. to the square foot. The contents of the pit will continue to subside, and with them also the covering, which should be constantly watched for cracks, until there is no further settling. Unless the contents are well compressed, they become overheated and the silage is rendered poor and uneatable. At the end of from three to six months the silage is ready for use, but it can of course be kept unopened for several months longer. The portions at the top and sides are nearly always over-fermented and not fit to be eaten, but all the rest is highly nutritious and wholesome, although it possesses a peculiar flavour and odour, to which cattle must generally become accustomed before they take to it.

A more elaborate method, which is, however, perhaps unnecessarily expensive, is to line the pit with masonry and cement, and effect the compression with planks and mechanical appliances.

What occurs in the pit while the silage is forming may be briefly described. Provided the temperature is not too high, minute organisms (ferments), the germs of which are enclosed with the fodder, grow and multiply rapidly. Under the action of these ferments certain acids, the most important of which are lactic and butyric, are formed at the expense of the carbo-hydrates present in the fodder. If air is not perfectly excluded, oxidation becomes too rapid, and the temperature rises high enough to kill a large proportion of the ferments, thereby arresting the formation of the two acids just named, so that *sweet* instead of *sour* silage is produced. Whichever kind of silage results, there is a loss of carbo-hydrates and of nitrogenous matters (especially of true albuminoids) and a consequent increase in the proportion of indigestible fibre. The total loss of solid matters varies from 24 to 28 per cent.

The difference between sweet and sour silage may be summed up thus. Sweet silage contains somewhat less water, a smaller quantity of acids (sweet silage from 0·02 to 0·1 per cent., sour up to 2 per cent.), and about ½ per cent. more albuminoids, but 2 per cent. less carbo-hydrates, and about 3 per cent. more undigestible fibre. Moreover, it does not keep so well as sour silage, and, when

given in large quantities to milch cattle, it taints their milk, although eaten in moderate quantities it improves it. On the whole, cattle take more readily to sour than to sweet silage.

Silage contains a smaller proportion of nutritive matter than hay; but, whereas hay can be made only with the finer grasses, the coarsest materials, that could not otherwise be utilised at all, can be ensilaged and rendered tender and palatable.

Section V.—Litter.

From an agricultural point of view, litter is the dry absorbent vegetable material placed under cattle where they are stalled, with the object not only of giving the animals a soft warm bed to lie upon at night, but also and principally of collecting, for use in the fields, their droppings and urine. In India, grass and straw are, as a rule, so abundant that the leaves and stalks of other herbaceous plants are hardly ever used; and, indeed, the practice of littering cattle obtains on only a very small scale, owing both to neglect and to so large a proportion of the cattle being either sent out into the forests to graze, or folded together, almost as close as they can stand, in an open railed enclosure.

Section VI.—Fibre.

Amongst herbaceous species, the most generally utilised for the fibre they yield are certain grasses, and a few species of Tiliaceæ and Malvaceæ.

None of our grasses yield any really textile material, their fibres being suitable only for making ropes, matting, and paper. The most important, as well as by far the most valuable, of our grasses are the bhábar (*Ischæmum angustifolium*) and the munj (*Saccharum Sara*).

The former grass grows gregariously on dry bare slopes along the foot of the Himalayas and in the hilly parts of Behar, Chota Nagpur, Western Bengal, and the northern districts of the Madras Presidency. The late Mr. Routledge, the great paper manufacturer of Sunderland, declared that "It closely resembles esparto, but does not contain so much glutinous and amylaceous matters, nor so much silica. * * * * * A small quantity of bleach brings it up to a good colour. The ultimate fibre is very fine and delicate, rather more so than esparto, and of about the same strength; the yield is, however, 42 per cent., somewhat less." Mr. Edwards, of the Lucknow Paper Mills, found the yield to be only a little more than 35 per cent., but the specimens he experimented with had been badly collected, the top parts of the plants being some-

what perished. We have thus in this grass an extremely valuable paper-making material, but unfortunately our few paper mills are not yet capable of turning out the finer kinds of paper, and are situated too far away from the bhábar-producing tracts for the raw material to be landed at them at remunerative rates. For the present, therefore, bhábar is used only for making cheap ropes. Doing up the grass into well pressed bales will, no doubt, reduce very appreciably cost of carriage.

The munj grows in abundance in all moist low-lying places, especially those which are occasionally flooded every year. Its fibre, which is obtained from the long sheaths closely enveloping the stalk, is used both for rope-making and for weaving into very durable and handsome ornamental carpet-like mats which white ants will seldom touch.

Grasses required for fibre should be cut only when perfectly ripe and as soon as they are ripe ; otherwise the nightly dews which then prevail, followed by the hot morning sun, would produce incipient decomposition and weaken or destroy the fibre. Before export, the cut grass should be cleaned of all decayed and useless portions. It is a fact proved by experience that annual cutting not only keeps up the quality of the grass, but also increases the yield. If cutting is neglected even for one year, the production falls off in an astonishing manner. The annual burning of the grass also improves its quality, by rendering it finer and more fibrous ; but it is evident that the forest on the dry hill-sides affected by the bhabhar grass cannot be burnt with impunity.

Amongst the herbaceous *Tiliaceæ* the most important fibre-producing species belong to the genus *Corchorus*, two of which, under cultivation, furnish the jute of commerce. All the wild species yield valuable fibre, but their utilization has hitherto been only local. Like the fibres of the mallow family next mentioned, the fibres are all textile and also make good cordage and paper. They deserve very much more attention than they have hitherto received.

In the mallow family, the herbaceous fibre-yielding species belong to the genus *Hibiscus*, and to them may be added the *Malachra capitata*.

The fibres of the plants belonging to both the above-mentioned families are generally anastomosed, but they are joined together so lightly as to be easily separated by a short period of maceration in water. Plants collected before flowering occurs, yield a finer and more silky fibre than they do later on ; but the strongest fibre is obtained when they are in fruit. The fibre must be extracted at once, otherwise fermentation sets in and deterioration ensues.

SECTION VII.—MATERIAL FOR THATCHING AND MAT-MAKING.

More than half the population of the empire live under thatch roofs, and nine-tenths of this enormous number under thatch composed of grass, used either by itself or with leaves packed in between, in order to secure more perfect tightness combined with lightness. The durability of grass under complete exposure to the sun and atmospheric influences is in direct ratio to the proportion of hard fibre it contains, and in inverse ratio to the quantity of sugar, starch and nitrogenous matters in it. Hence tough fibrous grasses are the best for the purpose, and no thatching grass should be cut until the seed has ripened and the stalks have begun to dry. After it has been cut, the grass cannot be dried too quickly and put away under shelter from dew and rain. The sooner it is used, the better.

For matting, the stalks of both sedges and grasses are employed after they have been deprived of their leaves. The most suitable species are those which have long, straight, well-silicified stalks, with sufficient fibre to prevent their being brittle. Like thatching grass, the material for matting should be cut only after the seed has ripened and the stalks are nearly dry. The matting made is not only used for covering floors, but also as a ceiling immediately under thatch roofs. It is also, when stiff enough, sometimes used directly for roofing, and especially for putting over open carts and stage coaches during the rainy season.

Another use made of the stalks, besides mat-making, is in the manufacture of "chicks." With the thick lower portion of the stalks of the large Saccharums are made the chicks commonly hung round verandahs in Northern India. In the Indian mode of paper manufacture a fine grass chick takes the place of the wire netting on which the half stuff is caught in becoming a sheet of paper.

SECTION VIII.—OTHER USES OF HERBACEOUS VEGETATION.

Numerous species are eaten by man as a vegetable, some of them being equal to the best kinds grown in kitchen gardens. Many others supply useful drugs, while some are used in the indigenous arts of the country. Two species of lichens, *Rocella tinctoria* and *R. fuciformis*, yield the *orchella* of commerce, which gives on treatment with lime, carbonate of potash and urine, a very valuable blue dye (litmus). Dyers use it also to produce crimsons. Khas-khas tatties and chicks, made of the roots of *Andropogon muricatum*, are well known. The demand for these

various species is, however, as yet too limited for any special reference to be made here regarding the mode of harvesting them.

CHAPTER II.—UTILIZATION OF THE FLOWERS AND FRUITS OF TREES AND SHRUBS.

The abundance and quality of flowers and fruit depend upon the exposure of the bearing trees to light. Some of the plants which produce saleable fruit and flowers either grow naturally in open places, or, being climbers, or trees towering above their companions, require no help to obtain the necessary amount of light. In all other cases thinnings must be made round every promising individual, both before the bearing age in order to promote its growth, and during this age to cause it to extend its crown and produce a large crop of flowers and fruit. When possible, trees furnishing valuable produce should be pruned just after a crop has been collected. The extent to which the flowering and fructification of any species should be encouraged will, of course, depend on the demand to be met, the prices to be obtained, and the relative value from both an economic and financial point of view, of the flowers or fruit, or both, as compared with timber and firewood.

In order to collect flowers and fruit, the ground under the trees should be kept perfectly clean, as, even if the produce is to be plucked off standing trees, a large proportion fit to be utilized will always drop on the ground. Flowers and fruit that require to be dried for the market should be at once spread out in an airy place and turned from time to time in order to prevent fermentation. They should also be preserved from rain and dew. When it is the seed that is wanted, the fruits should be treated as described in the Manual of Sylviculture. Occasionally, only the kernels of hard seeds find their way into the market; the quickest way to get rid of the shells is to pass the seeds between mill-stones kept sufficiently far apart to avoid breaking the kernel. When the shell is soft, instead of the upper mill-stone, a properly moulded mass of stiff clay may be used.

Flowers and fruit serve various purposes. Some are eaten by man or beasts, *e.g.*, the flowers of the Bassias (eaten raw or cooked after being dried; also yielding by fermentation and distillation a spirit resembling gin), *Bauhinia variegata*, &c., the fruit of the olive, Salvadora, Cashew, Zizyphuses, Artocarpuses, &c., the seed of the *Pinus Gerardiana*, *Buchanania latifolia*, &c. In years of gregarious fructification, which are often years of drought and scarcity, the seeds of the various bamboos afford food to the forest population. Others yield dyeing and tanning extracts, such as the

flowers of *Woodfordia floribunda* (colours leather red and contains 20½ per cent. of tannin), *Butea frondosa* (yellow and orange colours, much used at the *holi* festival), *Nyctanthes Arbor-tristis* (yellow), tun (yellow), &c., and the various myrabolams, and the fruit of *Mallotus philippinensis*, *&c.* The beleric and chebulic myrabolams, which are most valuable when gathered just before they are ripe, contain 30 to 50 per cent. of gallo-tannic acid, producing a soft and porous leather of a bright yellow colour. In 1880 the exports of myrabolams from Bombay and Kurrachee to London amounted to 235,000 cwts., valued at £180,000. In 1888-89 the quantity of myrabolams carried by rail and river in India, exclusive of Burma, exceeded 500,000 maunds, and was worth, in round numbers, 12 lakhs of rupees. From a third class of flowers and fruits oil is expressed or distilled, *e.g.*, the flowers of the various scented grasses, of jessamine, &c., the seed of the Bassias, the sál, olive, apricot, &c.

The oil of the Bassias and of sál is obtained by expression after boiling the seed and removing the hulls, the yield of oil being 40 to 50 per cent. of the weight of the hulled seed. The oil of all these species congeals at a lower temperature than ghee, which it resembles when solid, and which it is often used to adulterate. Numerous flowers and fruits are used medicinally, *e.g.*, the flowers of *Acacia Farnesiana*, &c., and the various myrabolams and the fruit of Podophyllum, of *Cassia Fistula*, *Strychnos Nux-vomica*, &c. A few kinds of fruit have special uses, such as clearing water (*Strychnos potatorum*), washing (the soapnut, *Acacia concinna*), poisoning water for fish (*Randia dumetorum*), &c. The fruit of the genus *Bombax* and *Calotropis* yield fibre which makes a soft stuffing for pillows and, in the case of one species, can also be spun.

(*To be continued*).

THE TREATMENT OF BAMBOO FORESTS.

I HAVE read lately "S. E. W.'s" article on the "Treatment of Bamboo Forests" in Nos. 4—6 of the "Forester" for this year with great interest. The whole question of the treatment of bamboo forests is one of very great importance and interest, and of course that treatment must vary according to the species of the locality. "S. E. W." refers to the male bamboo, *Dendrocalamus strictus*, and I am very glad to see that he, like myself, advocates cutting close to the ground, and considers that no harm results from doing so in spite of the native prejudice against it. That prejudice is, I expect, based rather upon practical than upon physiolo-

gical grounds : the bamboo cutter does not care to have to stoop to cut when he can with so much less exertion cut at a height which does not necessitate stooping.

In regard to the question of the seeding of the male bamboo his experience accords with mine, that it is more correct to say that flowering in any given locality is caused usually by some deteriorating influence, such as old age, a dry season, or maltreatment, rather than that it "flowers annually." I take it what writers like Brandis have meant by "flowering annually" is that in almost any given year, in a specific locality, certain clumps of the male bamboo may be found in flower. It does certainly sometimes flower gregariously in some localities, for it did so last year in the Golgonda forests of Vizagapatam and the year before in the Kurnool Nallamallais, and its doing so was probably caused by exceptional weather. But ordinarily, I think, a clump is found here and there in flower, and I fancy I have observed that in such cases it was a clump that had been overcut or partly blown down, or in some such way badly treated. Can we not now put together our experiences in the "Forester," and ascertain definitely what the behaviour of the male bamboo is in different parts of India?

Maltreatment is a source of extraordinary flowering even with those species which are acknowledged to flower gregariously. For instance, a few years ago I got beautiful specimens of the flowers of *Bambusa Tulda* from a clump in the Calcutta Botanic Gardens that had been partly blown down and half uprooted. Neighbouring clumps which had not so suffered showed no sign of flowering.

May I take the opportunity of asking your readers to help me with specimens of the flowers, leaves, sheaths, &c., of any species they may come across, and with any general or specific information about bamboos? I have been for some time engaged in collecting specimens of, and information about, the Indian Bambuseæ, a group of the highest forest importance, and specimens and information will be most gratefully welcomed, and most especially from Burma and the extreme south of India.

DEHRA :
16*th October*, 1890. } J. S. GAMBLE.

TRAINING OF JUNIOR ASSISTANT CONSERVATORS.

I AM aware that I am not starting a new idea when I suggest that Junior Assistant Conservators, when they first come out, should pass through a year of training in India, but I think the matter

has not been sufficiently considered, and I would add some points which I have never yet heard suggested.

When a man first comes to India he is put into some Division and employed in such ways as his ignorance of the language may admit of; but as a matter of fact he is not of much use except to draw his pay, and a Divisional Officer requires but little of him except to pass in the vernacular, and when at last he is put in charge of a Division, he has practically no knowledge of administration, and has to shake into it as best he may at great discomfort and to the exceeding damage of Government interests.

I would utilise this nondescript period by inducting the novice into the methods of Forest administration, teaching him the different systems of working in all branches in different Divisions, obliging him to pass in Indian Scientific Forestry (with its cognate subjects), and getting him through his examinations—at least his Lower Standard and Law.

But to arrive at this end I would be particularly careful to keep the Junior Assistant Conservators separate from the Sub-Assistant Conservators, Rangers, and Foresters at the Dehra School, whom they will eventually have to control, as to do otherwise would be highly subversive of discipline, and also because the course would not be the same; but Dehra might be their head-quarters and much of value might be learned there.

An officer of special all-round attainments should, I think, have charge of them, and take them through such books or lectures as was considered advisable, conduct them to all the most instructive places, and see that they worked at their departmental examinations—indeed have them properly instructed in the vernaculars.

But this introduces what is certainly something of a drawback, namely, the fact that it would be easier to acquire Hindustani than such languages as Assamese or Burmese. Hindustani, however, would apply to the majority, and as now the local Government lists are separate, it would not in reality matter, from a seniority point of view, to a man if one of his year in, say, the Punjab got through his vernacular examination and obtained his step while he himself (perhaps on the Burma list) was a year longer doing this. Of course, the fact of spending the first year in a Hindustani-speaking country might lose him a year of pay at a higher rate; but it might even be possible to have special teachers for languages other than Hindustani, or those suffering from this delay might be in some other manner indemnified. This is, no doubt, something of a drawback; but still I think the advantages of the plan should greatly outweigh the disadvantages.

Officers who have moved from one Circle to another will admit how much is gained by a knowledge of the different methods employed in different places. At present a man usually lives and dies in one Circle, and though he may be primed with the highest European theories (a very useful thing of course), yet he misses a great deal in India itself.

I think, too, it would be a great gain for a man, when he first took up a Division, to be better placed with reference to his passed upper subordinates who have been through Dehra.

Q.

"S. E.-W." ON THE TREATMENT OF BAMBOOS.

"S. E.-W.'s" notes on the treatment of bamboo forests in the Central Circle, North-Western Provinces, have been read by me with much interest, for I think that bamboos might receive more attention and consideration. The effect of fire conservancy on bamboo forests has not hitherto received any attention, and it would be good if any Forester who has considered the subject would give us his views thereon.

Has clause iv. of the Working Plan in force in "S. E.-W.'s" Circle been printed aright? It is not apparent why a higher price should be charged for bamboos extracted from blocks closed to cutting during the previous year. This seems a very doubtful measure of protection, inasmuch as it would lead to the extraction of immature bamboos.

Would "S. E.-W." kindly favour us with the form of pass in use under clause i. of the Working Plan, and with a copy of the price list under clause ii., by means of which the advantage previously gained by exporting inferior produce is annulled?

24th July, 1890. MAVIN-KAI.

THE ELECTRICAL PLANT OF INDIA.

THE Director of the Royal Gardens, Kew, has sent me the accompanying extract from "Iron" of the 11th July, saying he would be very glad if I could tell him what it refers to, and help him to reply to enquiries on the subject which have been made to him. It is never quite safe to say that anything is absurd or a hoax until it has been properly investigated, and so I hope you will kindly insert this in case some Forest Officer may be able to help in tracing the plant

referred to, and explaining what properties the plant possesses to cause such wonderful effects to be attributed to it. A somewhat similar case recently occurred of the "Barometer" plant, which, after some discussion, turned out to be our well-known small climber with black and red seeds, the *Abrus precatorius*. It was experimented with at Kew, but little or no result of a character to confirm its supposed power of indicating approaching weather-changes was obtained. It will probably be much the same with the "Electrical Plant," but we have first to catch the plant. I imagine that the Kew authorities have already made enquiries from the Editor of "Iron," which respectable newspaper is scarcely likely to have inserted the paragraph without some assurance of the *bonâ fides* of its author.

DEHRA: 16*th October*, 1890. J. S. GAMBLE.

"There has been discovered in the forests of India a strange plant which possesses to a very high degree astonishing magnetic power. The hand which breaks a leaf from it immediately receives a shock equal to that produced by the conductor of an induction coil. At a distance of 19 feet a magnetic needle is affected by it, and it will be quite deranged if brought near. The energy of this singular influence varies with the hour of the day. It is all-powerful about two o'clock in the afternoon, but is ineffective during the night. At times of storm its intensity augments to striking proportions. During rain the plant seems to succumb, and it bends its head during a thunder shower; it remains there without force or virtue, even if one should shelter it with an umbrella. No shock is felt at that time in breaking the leaves, and the needle is unaffected beside it. Our informant states that one never by any chance sees a bird or insect alight on the electric plant; an instinct seems to warn them that they would find sudden death. It is also important to remark that, where it grows, none of the magnetic metals are found, neither iron, nor cobalt, nor nickel, an undeniable proof that the electric force belongs exclusively to the plant."—*Iron*.

AN EDIBLE FUNGUS PARASITE.

THE Journal of the Bombay Natural History Society has recently published an account by Dr. Barclay of a fungus parasitic on the well-known forest tree *Acacia eburnea* of the dry districts of the Deccan. The following extract from the paper will doubtless be of interest to some of our readers:—

"This Æcidium is one of considerable interest, not only on account

of the largeness of its effect upon the host bearing it, but because it is only the second species of Uredine which, so far as I am aware, is known to be eaten by human beings. The large hypertrophies caused by *Æcidium Urticæ*, Schum., var. *Himalayense*, on the common nettle of the outer Himalayas (*Urtica parviflora*, Roxb) are eaten raw, as I have myself seen, by the poor people on account of the large amount of nutritious material stored therein by the mycelium of the fungus; but in the present case the pure fungus itself is apparently eaten, and after some elaborate preparation, as I am informed by Mr. Wroughton, to whom I am much indebted for the kind trouble he has taken in sending me specimens. I first received a small specimen of the fungus from Dr. Cunningham, F.R.S., in August, to whom it had been sent, through Mr. Cotes, of the Indian Museum, Calcutta, by Mr. Wroughton. This had been gathered at Poona, but as the specimen was insufficient in many respects for any useful description, I addressed Mr. Wroughton, begging him to send me other specimens, and for any general information he might be able to gather concerning it. To this he responded most generously, and all the information this paper contains, other than the mere diagnostic characters of the fungus, is his.

"There was at first some doubt concerning the botanical identity of the host, but Mr. Wroughton has convinced himself that it is undoubtedly *Acacia eburnea*, Willd., and known to natives as Múrmúti. In certain areas of the Poona district the fungus is most common, every tree or bush being covered with it; and it occasions such distortion and dwarfing of the host that attacked trees may be recognised from a great distance. The parasite appears to distort the stem much as the mistletoe does the stem on which it grows. As Mr. Wroughton says, 'it is fortunate that *A. eburnea* is of no value as a timber tree,' as otherwise the presence of the parasite would undoubtedly give rise to much loss.

"The specimens I received showed, even on cursory inspection, that the parasite had a generally pervading and probably perennial mycelium, and that the presence of this mycelium caused an excess of longitudinal growth in shoots, with very considerable hypertrophy or thickening. Dr. G. King, F.R.S., writes of specimens he received:—

"'It is curious to notice how the capitate heads of the Acacia become elongated when attacked by that curious fungoid growth. * * * * * * * * Anybody examining such diseased heads and not seeing the healthy one would at once refer them to some of the set with spicate inflorescence.' The fructification of the fungus is always found at the ends of flowering shoots and not generally on the larger shoots. This consists mainly of an immense number of Æcidia (peridia) dotted thickly over the younger attacked parts of the host. They are bluntly conical bodies about 1 m m. in height and 1 m m in diameter.

"Before proceeding to a detailed description of the fungus, I may

here note that it is apparently these Æcidia which are eaten. They are readily scraped off the host. As I understand it, these Æcidia, having been scraped off, are boiled until quite soft, and when cold are rubbed up into a mess with spices and then warmed up and eaten as a relish. Mr. Wroughton writes:—'I find all the people eat it freely.

"The first specimen I got through Dr. Cunningham, if collected immediately before it was sent to him, must have been gathered in July or early in August, and the next specimen I got direct from Mr. Wroughton was gathered on the 11th January. Each specimen contained ripe Æcidia; but I have no definite information as to the seasons during which the ripe Æcidia are found and during which they are absent. From the last specimen sent to me in alcohol it would appear that the Æcidia are produced during the time the host puts forth new shoots; this may be once or twice a year."

NOTES ON FOREST UTILIZATION—A CORRECTION.

In the *Indian Forester* for April—June, p. 137, it is thus written, or printed rather:—

"1. *Shingles.*

"Wooden shingles can be used only in cold dry climates where snow lies in winter. Actually their employment is confined to the Western Himalaya," &c.

When I was in Burma and Rangoon, in 1865 to 1870, the highest class of roofing, in Rangoon at least, was teak shingles, though corrugated iron was then coming in. I do not know whether shingles have quite gone out. These were not split, but sawn, and were 15 inches long by 5 inches wide, and of tapering thickness from $\frac{3}{4}$-inch, I think, at the thick, to $\frac{1}{4}$-inch at the thin end. They were laid with 10 inches overlap, so that only $5'' \times 5''$ of each shingle was exposed and of course they broke joint.

A cheaper roof, within reach of the coast and for some distance inland with water carriage, was thatch made of the leaf of a palm which grows in tidal waters—*Nipa* I think; the pinnæ or segments of the leaf were cut off from the midrib, and then fastened to thin pieces of bamboo 3 or 4 feet long, by bending them over it, and pinning them round it in rows, each row being called a leaf. These leaves were laid overlapping, just like the grass tatties here; the overlap was 3 inches.

When in the forests east or north-east of Simla, about Narkanda, in 1886, I saw some men up a large fir, which had fallen and was supported in a sloping position by other trees, who were

cutting large slabs off with their axes. I learned that the slabs were used for roofing. This was not splitting, nor could you well call the slabs shingles; but here is another mode of using timber for roofing.

Another use for split wood you have not mentioned is tooth-picks! In India the bamboo is chiefly used for this, but I can remember that my father, when I was a small boy, bought tooth-picks made of lance-wood (botanical name at present not available).

Excuse this trifling, but the use of teak-wood shingles in the hot damp climate of Rangoon is a substantial correction of the passage I started by quoting.

C. W. HOPE.

FOREST SCHOOL ATHLETIC SPORTS.

THESE sports were held at Dehra Dún on Saturday, 15th November, in the presence of a large number of spectators, amongst whom were Sir E. Buck, Secretary to the Government of India, and Mr. H. C. Hill, Inspector-General of Forests. Some of the events excited keen competition, especially the hurdle races and the high jump, and the sports altogether went off most successfully, and showed, as the Mounted Rifles sports had previously done, that the Forest students could hold their own on the green sward as well as in the jungles.

The following were the chief events and the winners :—

100 yards' race (whole school).—(1) Haslett, (2) McLeod, (3) Kavanagh.

Half-mile (whole school).—(1) Haslett, (2) Ferguson, (3) Lowis.

220 yards' race (Natives).—(1) C. Appaiah, (2) Mehdi Hasan, (3) Narsinha Murti Rao.

Hurdle race (Natives).—(1) M. G. Rama Rao, (2) Mehdi Hasan, (3) Srinivasalu Naidu.

Hurdle race (whole school).—(1) Haslett, (2) Seager, (3) Lowis.

Broad jump { Whole school, Haslett, 18 feet 4 inches.
Natives only, Uttam Singh.

High jump { Whole school, McLeod, 4 feet 11 inches.
Natives only, Maung Charley.

Putting the shot —McLeod, 33 feet 4 inches.

Throwing the cricket ball. { Whole school, Seager, 93 yards.
Natives only, M. G. Rama Rao.

Tug-of-war.—The senior class.

The chief of the events, it will be seen, went to Haslett and McLeod, and among the natives M. G. Rama Rao distinguished himself greatly.

The prizes were kindly distributed by Mrs. Fernandez, the wife of the popular Deputy Director, and after cheers for the prize distribution, our distinguished visitors, the Director and officers of the School, and the ladies, the meeting broke up. The thanks of the School are especially due to the officers of the 2-2 Prince of Wales' Own Goorkhas for the kind use of their band, which did so much to enliven the proceedings.

SOMETHING LIKE TIMBER.—Boards each 100 ft. long and 6 ft. in width would be a sight worth seeing, but piles made of such timber are common at the mills in Puget Sound, North Pacific. According to a traveller just returned from a visit to that coast, boards of those dimensions, and without a knot in them, are common cuts from the gigantic fir trees of the Puget Sound forests. These trees grow to the enormous height of 250 ft., and the forests are so vast that, although the saw-mills have been ripping 500,000,000 ft. of lumber out of them every year for ten years, the spaces made by these tremendous inroads seem no more than garden patches. Puget Sound has 1,800 miles of shore line, and all along this line, and extending thence on both sides miles and miles farther than the eye can see, is one vast and almost unbroken forest of these enormous trees. There is nothing like it anywhere on the Pacific coast. An official estimate places the amount of standing timber in that area at 500,000,000,000 ft., representing a constant supply for 1,000 years, even at the enormous rate the timber is now being felled and sawed. The timber belt covers 30,000,000 acres of Washington Territory—an area equal to the States of Vermont, Massachusetts, Connecticut, and New Hampshire. The markets for the Puget Sound lumber are entirely foreign, being South America, Australia, Central America, and the Pacific coast islands.—*Iron.*

JJ. Shikar.

NATURAL HISTORY NOTES ON THE TIGER.

In a light and interesting book I was lately reading on sport in India, much emphasis was laid on the assertion that it had fallen to the lot of few sportsmen to witness the method adopted by tigers in securing their prey and their mode of hunting and killing their victims, and it appeared to me that a few personal reminiscences might be acceptable; for if we value the tiger for the sport he affords, it is but fair that we should interest ourselves in his habits.

The usually accepted theory is, I believe, that the tiger either lies in ambush or sneaks up to the unsuspecting deer or cattle, then suddenly springing on his prey tears open the main blood-vessels of the throat and eagerly drinks the blood of his palpitating victim. Though this method of attack may sometimes be adopted, I am disposed to think that, as a rule, much greater exertion is necessary on the tiger's part before he secures his meal, whilst the manner of inflicting death and the subsequent proceedings require elucidation. It has often struck me that if the tiger were not so unnecessarily cautious, he need not remain so often hungry as he undoubtedly does; as his hunger increases his caution diminishes, and so he arrives ultimately at a satisfactory meal. As a proof of this, I may state that on several occasions I have seen a tiger in the close vicinity of deer and cattle which he certainly wanted to eat, and might easily have secured, but being discovered, and, I suppose, suspecting some hidden danger, he preferred to lie still or wander growling around; for it is a curious fact that neither cattle nor deer rush madly away when they detect the presence of a tiger, but seem rather to prefer to keep him in sight, the deer uttering loud notes of warning, whilst cattle, with that stupidity induced by association with man, take no measures for safety beyond clustering together in a body.

Unless driven to extremity by ill success in the hunting field, a tiger will, however, for choice always devote his attention to a

single animal and avoid charging a herd, and he will naturally prefer following his prey to meeting it.

When the country is open and the grass burnt, a tiger depends a great deal on his keen sight to detect the whereabouts of deer or other food, and having observed, often from a great distance, the desirable object, he will proceed with the utmost care to arrange his plan of approach. Taking advantage of every opportunity offered for concealment, he works his way gradually towards his prey, and when discovered or when further concealment is impossible, he courses a deer with a quite unexpected turn of speed ; a sudden dash of 200 yards in the open is nothing uncommon, and the greater part of this distance is traversed before the startled deer can appreciate its danger or attain any speed in flight. I was once quite intimately acquainted with a tigress who used to catch hog or deer almost daily on a perfectly open and burnt up plain, where the deer were feeding on the young grass, and by the number of her kills she was apparently enjoying good sport. The keen sense of hearing the tiger possesses is, however, absolutely necessary to him at those seasons when the grass is high. At this time he is often obliged to hunt by scent and hearing, and having approached the game by stealth, attracted by the slight noises made in moving and browsing, the question is how to seize an animal which he cannot see. Any sportsman who has had the misfortune to be involved in high grass and has made the attempt to rejoin his invisible companions, even though assisted by the knowledge of their whereabouts and the sound of their voices, will appreciate the difficulties the tiger has to encounter in such a case. I had a short time ago the opportunity of witnessing and sympathising with a hungry tiger in these trying circumstances. I had fired at, and missed, a stag standing amongst a herd of spotted deer. The animals were greatly startled and dashed wildly down a declivity on to a level plain, where the grass stood about four feet high ; the stag here apparently rushed headlong on to a sleeping tiger. The tiger arose with a surly snarl, and I was much interested to note the agility displayed by the stag and the precipitancy of his flight, and wondered if his escape from express bullet and tiger claws would have a sobering effect in his future life. Meanwhile the remainder of the herd were scattered over the plain, some 15 deer being within 50 or 60 yards of the tiger. They were aware of his presence and were giving warning cries, and from my elevation in the howdah I could see the heads of the animals, though they could not see each other. The tiger, whenever the voice of a deer or a rustle in the grass proclaimed its whereabouts, rushed in

the direction of the sound bounding over the grass and frequently arriving within a few yards of a deer before it fled screaming. This went on for some time; but the tiger was not successful, in fact he nearly got into trouble by mistaking the sound of my moving elephant for that of a deer and springing eagerly towards me. Ultimately the hunt dispersed without bloodshed, but leaving to me a charming memory of a quarter of an hour spent without ill feeling or constraint in the society of a tiger.

With regard to the method adopted by the tiger in securing and killing his prey, it appears to me, from what I have observed, that small animals are despatched by a blow from the fore paw. Such a blow is sufficient to instantaneously kill a small deer or a man by smashing the spine or skull, and I have seen cases both of men and deer where death was caused in this manner without aid from the jaws or claws. In the case of more bulky animals, a young tiger will sometimes make the mistake of using his fore paws on a flying beast, and I have seen a buffalo maltreated in this way, but not mortally wounded. The experienced tiger leaps on the back of his victim and grips the neck in front of the withers with his jaws, one fore paw clasps the shoulder of the animal, the other is fully extended under the throat. Then, should the spine not be crushed by the tiger's jaws, and in the case of cattle and large deer this will easily happen, the head of the animal is jerked violently backward and the neck is thus broken. I have examined hundreds of animals killed by tigers and have never yet detected injury to the blood-vessels of the throat, but invariably marks attributable to the above-mentioned method. The tiger often has an unpleasant task if he proposes to devour an old boar, for there appears to be some difficulty in the way of breaking a pig's neck with dispatch, and the attempt sometimes resolves itself into an unseemly scuffle lasting for hours, and occasionally terminating fatally for the tiger; for it is evident that to get the pig under you is to put him in the position he rejoices to hold if eager to use his tushes.

The tiger has two ways of removing his prey to safe quarters. The first, adopted with animals up to the size of a cow, is to seize the carcase by the middle of the back and carry it bodily away. This system should, however, in the interests of the sportsman, be discouraged, as it leaves a poor trail save in loose soil, where the marks of the fore and hind feet of the kill are visible on each side of the tiger's track. The second method is to grip the kill by the neck and drag it along the ground; this leaves a good mark, easy to be followed, the tiger's track being to one side of the kill. If any steep or difficult place is to be surmounted and the animal is heavy,

the tiger will drag it up, walking backwards himself; but difficulties apparently insurmountable are overcome by his strength and agility. I have known a young tigress, which, by the way, had killed about 60 persons, to leap up a perpendicular rock some six feet high with a man weighing nearly 11 stone in her jaws; and on another occasion a male tiger dragged an exceptionally large buffalo up a bank at least 10 feet high.

Having reached a suitable spot the tiger does not, unless very ravenous, commence at once to eat. As far as I have observed, he will wait for some time in the vicinity of his kill, often till nightfall, apparently suspicious of being followed. When he commences his repast, it is invariably by attacking the hind quarters, and he will gradually progress towards the head. A large tiger will eat a spotted deer or a half-grown buffalo at one sitting; a full grown cow or a sambhar stag will give him two days' work, and even perhaps a little playful picking on the third day. As a rule, there is no waste of food; if undisturbed, a tiger will leave nothing but the skull and hoofs, and he even appears to take a grim satisfaction in carrying away the scent of his repast by frequently rolling in the dining place. On the whole, I am disposed to think that, whilst young tigers are frequently blood-thirsty and cruel beyond their requirements, a mature tiger is a careful and methodical beast, who does not go beyond his wants to cause suffering, and who is much less feared by his neighbours in the jungles than is man, and with good reason. He does not kill for sport; the death he deals is sure and quick, and he never leaves a wounded or disabled animal to die in prolonged agony, if not disturbed in his work.

OBSERVER.

III. TRAVELS.

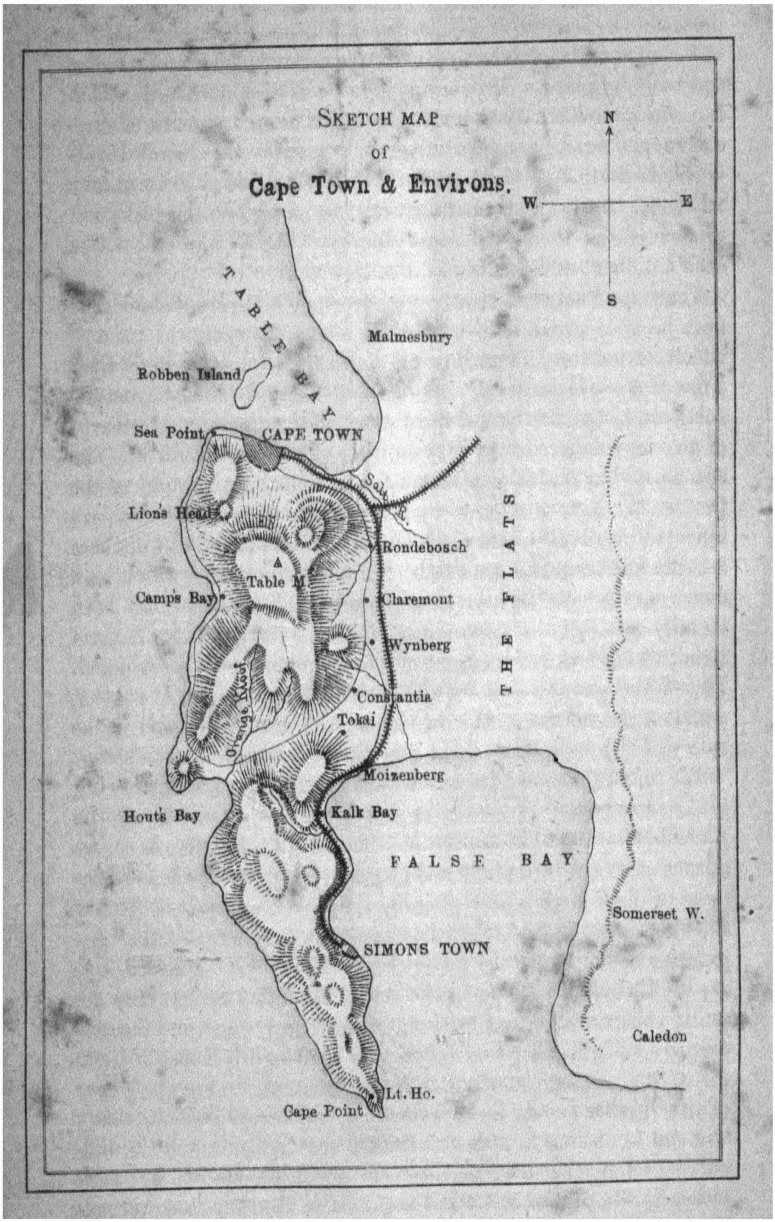
A FORESTER'S SHORT VISIT TO THE CAPE PENINSULA.

I LEFT England on May 23rd, 1890, in the Castle Line steamer "Grantully Castle" with a number of fellow-passengers, mostly bound for the gold fields of the Transvaal. The voyage was, like all such voyages, without much incident beyond the usual amusements, the sports, the concerts, and calls at Lisbon and Madeira, and after 19 days' steady steaming we anchored in Table Bay. Anchor was let go in the middle of the night, and of course I took a speedy opportunity of going on deck to see the far-famed mountain. It was well worth early rising, for the scene was a beautiful one. The black flat-topped mass of rock, flanked on the east by the outlying "Devil's Peak" and on the west by the "Lion's Head" and surmounted by a brilliant star, possibly Sirius, stood out gloriously, just touched by the orange glow of the first flash of dawn. In the semi-circle formed by the mountains, and sparkling here and there by a stray light still burning, lay Capetown; and the whole effect, enhanced by numerous craft at anchor or crowding the neighbouring docks, was one I shall never forget. As soon as it was light, we steamed into dock, and the usual scene of greeting between passengers and their friends began. I was not long in Capetown, but soon found myself in the train on the suburban railway for the beautiful Wynberg, the favourite suburban resort of the business people of the metropolis of the Cape Colony. The railway station is on the beach of Table Bay, at the bottom of Adderley Street, the chief thoroughfare of Capetown, and the line passes thence eastward through the "Castle," a curious old fort, a relic of the Dutch times, and now used as the Military Head-Quarters, to Salt River, where it leaves the main line and turns southwards, rounding the outlying spurs of the Devil's Peak through Rondebosch, Newlands, and Claremont. There are stations almost every half mile, and a constant stream of passengers, nearly all first class, for on the Cape of Good Hope Railways the third class carriage is occupied by Kafirs or Hottentots, and the single second class by

Malays, a few poor Europeans, and an occasional red-coat. After it leaves Wynberg the shores of False Bay come into view, and the coast is reached at Muizenberg, whence the line follows it at the foot of steep hills to Kalk Bay, a favourite summer resort and bathing place. The continuation on to Simon's Town, which is seen from Kalk Bay across the sea, is now in course of construction, and in a comparatively few months the Naval Head-Quarters Station of England in the south of Africa will be in easy reach of Capetown dwellers by rail, and a visit to the rocks and precipices and the grand coast scenery of Cape Point will not be such a difficult undertaking as it is at present.

The Cape Peninsula clearly must at some not very distant time have been an island, for even now the low sandy plains or "flats" which lie between Table Bay and False Bay cannot be more than a few feet above sea level. As one comes into Table Bay from the north-west, the flat-topped precipices of the finest of the scarps of the mountain rise directly in front of one facing north. The accompanying sketch map shows fairly well the geography of the peninsula. Round to the west, facing the open sea, the scarps are much more divided into clefts and ravines, and the chief of these are the fine crags known as the "Twelve Apostles," which look down on Camp's Bay, a small watering place, which has been steadily growing in importance since the magnificent Victoria Road, which makes the circuit of the mountain, was constructed. The eastern scarps look down on the villas and gardens of Wynberg, while on the northern side the slopes are more gentle, and in the valley of "Orange Kloof" run down into the beautiful Hout's Bay.

We found Capetown in considerable political excitement owing to the introduction of a large project of railway extension into the Assembly, and the expectation of a change of Ministry in consequence of its not being fully and generally approved. The Government of the Colony is carried on by the Governor (now Sir Henry Loch) with two Houses of Parliament, called respectively the "Legislative Council" and the "Legislative Assembly." These sittings are held in a fine building at the top of Adderley Street, only recently constructed of red brick faced with grey stone, and the procedure adopted is almost exactly that of the English House of Commons, the debates in the Lower House being under the presidency of the Speaker (now Sir D. Tennant), who wears the customary wig and has before him the traditional mace. It is a little difficult to follow the debates, the members being allowed to speak either in English or in Cape Dutch. The Ministry in power was that of Sir Gordon Sprigg, but just as I left the expected change


SKETCH MAP
of
Cape Town & Environs.
N
W
E
S
TABLE BAY
Malmesbury
Robben Island
Sea Point
CAPE TOWN
Salt R.
Lion's Head
Rondebosch
Table M.
Camp's Bay
Claremont
Wynberg
THE FLATS
Constantia
Tokai
Orange River
Moizenberg
Houts Bay
Kalk Bay
FALSE BAY
Somerset W.
SIMONS TOWN
Caledon
Lt. Ho.
Cape Point

came, and it was understood that the new Premier would be Mr. Cecil Rhodes, the "Diamond King," Manager of the great Kimberley Mines. It seemed to me that parts of the railway measure had much to recommend them, but that as a whole it was too large and too obviously intended to try and satisfy everybody. The fact is that there is considerable jealousy between rival districts, and the rival ports of Capetown, Port Elizabeth, and East London are each anxious to secure for themselves, to their own benefit and the detriment of their rivals, the trade with the interior, and especially that with the Orange Free State and the Transvaal Gold Fields. And so the result was the rejection of the railway measure. Whether Mr. Rhodes and his colleagues will succeed in framing a better, remains to be seen.

The town of Capetown itself is in process of improvement: it already has some fine buildings, and the chief streets are clearly in process of re-construction in a better style than the old irregular one of houses of all sizes and shapes, evidently quickly run up in the beginning of commercial enterprise. But, except near the Parliament House and the Governor's residence, trees are few, and as the slopes of the mountain behind are bare, the lover of trees is glad to exchange Capetown for Wynberg. The continuation of Adderley Street past the Botanic Gardens is an avenue of oak, which must at one time have been very fine, but many of the original trees have been killed out, and the rest have had to be pruned and their hollows filled with cement, so that the avenue is now rather irregular. As for the Botanic Gardens, they are simply a disappointment, though the Director, Prof. McOwan, does his best with the small funds available. The stag-headed appearance of the chief trees points to what is the actual fact, a water-logged subsoil, the bed of an old river, while the untidy and unkempt appearance of the gardens shows clearly the little interest taken by the Colony in botanical science, and points to a want of appreciation of the benefits which a really well-conducted botanical head-quarters station can confer on a country which is, after all, chiefly agricultural. Of course there are a few good trees, such as the Araucarias and the deciduous Cypress, some interesting indigenous trees like the Yellow-wood (*Podocarpus*) and the delicious Natal plum (*Carissa edulis*), which it was an experience to taste; but the famous big *Eucalyptus Globulus*, said to be the first of the species introduced into the Colony, was a very poor specimen compared to numbers that may be seen any day on the Nilgiris in South India: and on the whole the collection was a poor one. I was in hopes, when I visited the garden, of finding a named collection of

the Cape heaths, the Proteas, the Geraniums, the Gladioli, and the other chief constituents of the beautiful and most interesting "bush" or "veldt" vegetation; but the gardens had not even a single Silver tree to show a stranger, and the heaths, and indeed all flowering plants, were conspicuous by their absence. What ought to be done is to convert the present Botanic Garden into a small park and throw it open to the public, handing it over to the Municipality, who would probably then try to make it as pretty and interesting as such parks are everywhere in Europe as well as in America, India, and Australia.* And then a new Botanic Garden should be made on suitable soil near some one of the stations on the suburban railway, such as Rosebank or Rondebosch, or even Wynberg, and of an area of at least 200 acres, so that it might have plenty of space not only to grow and exhibit the indigenous flora, but to experiment with exotics. And the absurd idea of such an institution "paying" should be totally abandoned. If this were done, under the best management, and with a really good herbarium and botanical museum, the Botanic Gardens of Capetown would be to the Colony what "Kew" is to England, the Calcutta Gardens to India, or Peradeniya to Ceylon. Some of the private gardens in the suburbs are very beautiful, and as an example one can point to the beautiful estate of Mr. H. M. Arderne at Claremont as showing clearly what can be done. His gardens possess specimens from almost all parts of the world, and it is certainly strange to find the date palm overshadowing the English holly, and the English oak side by side with the bamboo of India and China. A good botanic garden would pay indirectly, if it did not directly.

Wynberg and indeed the whole of the beautiful villa-country on the eastern side of the mountain is well wooded. Just as it does in climate, so too does it in scenery, possess a considerable resemblance to the Nilgiris, the more so that the Blue Gum (*Eucalyptus Globulus*) is common and the Australian wattles are frequently met with, though of species different to those of Ootacamund. There it is the blackwood (*A. Melanoxylon*) and the white wattle (*A. dealbata*) that are everywhere seen, while at the Cape the chief species are the golden wattle (*A. pycnantha*) and the willow (*A. saligna*). But the chief vegetation is afforded by the pines, the cluster pine (*P. maritima*) and the stone pine (*P. pinea*), the latter of which is especially remarkable for the magni-

* I hear that Port Elizaboth is already possessed of such a park, and the gardens of Grahamstown are already famous.

ficent avenues it forms, and for its strange habit, even when planted in isolated lines, of raising its tops to the same level. These two pines reproduce abundantly; and seeing how very successful has been their growth and that of the English oak (*Quercus Robur*), one is rather surprised that when planting operations were undertaken by Government these trees were not the chief ones used. It is said that their wood is not good, that it is soft and unsuited for building, and that it is a bad fuel, but then it has to be remembered that so far only trees of ages less than 40 years have been tried, and that the chief wants of the Colony are railway sleepers and mining props, for both of which purposes creosoted pinewood would be probably the cheapest and best material. Among other introduced trees, the most noticeable are the Araucarias, whose growth is really magnificent, while indigenous tree vegetation is scarcely represented, and that only on the hill slopes, as on Wynberg Hill, and not lower down, by the beautiful silver tree (*Leucadendron argenteum*). Wynberg is, indeed, too much overgrown with trees, though perhaps the winter visitor is apt to forget what shelter they give when the summer heats and the strong south-east winds prevail.

The Cape Government possesses two important experimental institutions in the Groot Constantia vineyards and the Tokai forest nurseries and plantations. These two estates lie on the flat and the adjacent hill slopes between Wynberg Hill and False Bay. The former has beautiful vineyards, and of late years a great deal has been done to improve the quality of the wines produced in them, and to show vine growers in the Colony generally how best to make their vineyards profitable. Under the teaching of an expert from Hungary, Baron von Babo, wines of a lighter character are being made, and I can only say that I found some of them excellent. The chief red wine is "Hermitage," a wine somewhat like the well-known Burgundy of the same name, while of white wines the best are the "Drakenstein" and the muscatel-flavoured "Hanepoot." The vineyards have suffered considerably from Phylloxera, and some of the finest have had to be given up; for even if the plants have been dug up and the land replanted, the pest has only come on afresh on the new plants. Great precautions are now being taken, however, and it is hoped that the Phylloxera will now gradually disappear.

The neighbouring nurseries and plantations at Tokai are on an old Dutch estate not far off, and are managed by the local Conservator of Forests, at present Capt. Harison. I visited these on the 27th June in the company of Count de Vasselot de Regné, and

was greatly interested in them, although, being midwinter, the season was not the best for such a visit. The Conservator lives on the estate in an old Dutch house, itself alone very interesting to see. Near it are the extensive nurseries, the Arboretum, and, partly on the sandy plain in front, partly on the hill slopes behind, the forest plantations. In the nursery we found a very great variety of species of Eucalyptus, many valuable Coniferæ, and other trees, and the utility of the nursery to the public in general may be gauged by the fact that in 1889 some 80,000 transplants were sold, realizing a revenue of £286. Mr. Harman, the intelligent local Forester in charge, gave me much useful information, and, especially in regard to the Eucalypti, the nursery was most interesting to one who has to deal with numerous species of the same genus in his Nilgiri nurseries. The seeds are sown either in open beds, or, if valuable, in tin boxes or in pots. When sufficiently grown, they are transplanted to tin boxes and finally moved from them eventually to the places they are to occupy in the plantations. The beds of young pine, including not only the stone and cluster pines, but the Scotch pine (*P. sylvestris*), the Indian long-leaved pine (*P. longifolia*), the Aleppo pine (*P. halepensis*), the *Pinus insignis*, *P. canariensis*, and others, were especially good. Much is expected of the '*insignis*' and '*longifolia*,' though for my own part I expect they will not prove so useful as the stone and cluster pine, which have already proved themselves to be fully acclimatized in the Cape Peninsula, for both of them, when quickly grown, have even softer woods than these species. Among the Eucalypti the chief species grown are *E. diversicolor*, *E. robusta*, and *E. cornuta*—the latter a species of small size and shrubby habit, which has proved very useful as a nurse to other kinds. The chief Acacia planted is the golden wattle (*A. pycnantha*), of which great things are expected in the two-fold capacity of a yielder of tanning bark and a fuel, but the Myallwood (*A. homalophylla*) is also grown. Among other trees were the South Africa cypress (*Widdringtonia*), some Australian *Frenelas*, yellow-woods (*Podocarpus*), and the fine cypresses (*Cupressus macrocarpa* and *funebris*), but, except the yellow-woods and cypress, the indigenous vegetation seemed to be neglected. There were many fine beds of oak (*Quercus Robur*), but few other of the European deciduous trees. Near the nursery is the Arboretum, a plot of land laid out as a kind of forest botanic garden, in which are authentically-named specimens of trees capable of being grown in the Colony, both indigenous and exotic. This is the sort of garden that, as I have already said, ought to be made more widely useful under a botanical scientific head. In the

Arboretum I was introduced to the stinkwood (*Oreodaphne bullata*), recognizable by the two curious pits on its laurel-like leaves, various Casuarinas, the Cape holly, and to such old friends as the Toon tree (*Cedrela toona*).

The plantations cover, I understand, about 2,000 acres, of which about 90 acres were new plantations of 1889-90. Unfortunately the annual reports give but very little information regarding areas, such as would be useful and interesting additions to them, and in this way they compare unfavourably with those of India, where elaborate and careful area statements are the rule. About half of the plantation is on the flat or old "veldt" land. This "veldt" or heath land was formerly covered with a dense shrubby growth of heaths, Proteas, Restiaceæ, &c., all with thick matted roots, so that it was found necessary to clear the bush by cutting and burning, and then to plough either all over the area or in broad lines. On the flat, the planting has chiefly been of Eucalyptus, but in places it has been alternated with pines and in some plots with Acacia. One large plot had been planted with half Eucalyptus and half *Acacia pycnantha*, the latter being looked upon as the nurse; but the Forest Officer seemed to object to this, as the dense mass of roots formed by the Acacia seemed to have the tendency to choke the Eucalyptus. To my mind, however, looking at the value of the wattle as giving both bark and fuel, and its excellent growth compared to the gum tree, it would be more profitable to consider the former as the most important tree and to grow it, as its allies are grown in South India, in simple coppice on short rotation calculated so as to yield the maximum annual yield of both products. I understand that eight years is said to suffice for this. The chief Eucalypti are *E. diversicolor* and *E. robusta*, with some *E. Globulus* and *E. cornuta* as nurses. There are numerous other species, however, but a very short inspection brings out the fact that the *diversicolor* is the most successful species that has been grown. The *Globulus* seemed very poor in comparison with the magnificent way in which it grows on the Nilgiris. Great things are expected in the Colony from this plantation, in which the Commissioner of Crown Lands (Colonel Schermbrücker) is said to take a very great interest, and doubtless as an *experimental* plantation it is a fine and valuable work. But I fear that financially it will not be a success, at any rate not such a success as it would be if it had been formed of the species whose hardiness and speedy growth had been abundantly proved, the oak and the pines.

The hill-side plantation also contains a certain amount of Eucalyptus, but the Conifers are distinctly and very properly the chief

trees. Among them *Pinus insignis* and *Cupressus macrocarpa* are most prominent for good growth; but, as with the plantation on the flats, there is too little regularity, and for some reason or other the growth is patchy. As I have before said, the plantation is a most valuable one as an experiment, but I fear that financially it will prove a disappointment. I cannot conclude these remarks upon Tokai without expressing my admiration for the fine broad fire-protection lines and the good bridle-paths leading up the mountain. Fire-protection is a matter of the very first importance, for only last year the plantation was seriously menaced, and every year there are bush fires of greater or less magnitude on Table Mountain. Even during my visit, in the winter season, there was one small fire on the mountain, and at night the bright lines on the hill-sides to the east showed where fires were burning near Somerset East on the range about Sir Lowry's Pass. Next in importance to fire as a danger to be guarded against are the severe storms, which often blow with terrible violence during summer from the south-east and during winter from the north-west. It would, therefore, have been well, as Count de Vasselot explained to me, to have begun by planting shelter belts, and possibly this will be done in future. To conclude, I would mention the want of a good map* of the demarcated reserve in which the plantation is, with a definite scheme for future works; and my opinion is that to such works in future greater attention be paid to financial prospects, and to the kind of material most in demand for the Cape-town supply.

It is much to be regretted that I was unable to accept Count de Vasselot's kind invitation to me to inspect other forest works in the Cape Division, such as the Worcester Plantation, those of Kluitjes Kraal, and Cape Flats, and that on the top of Table Mountain; and still more do I regret that I had not more time so as to have been able to go and see the large natural forests of the Knysna and Tsitsikamma along the coast between Capetown and Algoa Bay.

The Cape Forest Department is under the management of the Superintendent of Woods and Forests, Count de Vasselot de Régné, a distinguished French "Inspecteur" well known for his admirable work in the planting of the Dunes de la Coubre at the mouth of the Garonne and between it and the Ile d'Oléron. Under him are four Conservators of Forests, in four Divisions or Circles, *viz.*: (1) Western, Captain Harison; (2) Knysna, Mr. D. E. Hutt-

* The Colony altogether seems to be very badly in want of good maps like our Ordnance survey.

chins ; (3) King William's Town, Mr. J. S. Lister ; (4) Transkei, Mr. C. C. Henkel, and each has a staff of District Officers, Forest Rangers, and Forest Guards. Messrs. Lister and Hutchins are both old Indian Foresters. With the exception of Mr. Hutchins, none of the officers are professionally trained Foresters, and the chief wants of the department at the present day in organization are :—

(1). More professional superior officers.

(2). A Forest School for the training of the staff.

(3). A better system of organized departmental discipline.

In order to supply more professional Forest Officers speedily, the obviously best course for the Colony to adopt would be to select some four to six young men, by preference graduates of the Cape University, who can speak Cape Dutch, and to send them for a three years' course at the Cooper's Hill Royal Indian Civil Engineering College, where there are now excellent arrangements for the training of officers for the Indian Forests. One of these could probably, after some experience of work in the districts, take charge of a Forest School, which might either be at Tokai or attached to the Agricultural College of Stellenbosch, and the others would be posted as District Forest Officers and become available for promotion to Conservatorships as vacancies arise. In this way a proper professional staff might be obtained as speedily as possible. The organization of the department seems to require improvement, if it is the case, as I understand it to be, that the officers at the head of the Crown Lands Office constantly correspond direct with junior Forest Officers and ignore the Superintendent. No head of department can be expected to maintain his enthusiasm and work well unless he is really treated as head and is made to feel that the Government has confidence in him. Another want, in my opinion, is the full introduction of a proper selection and demarcation of Crown forests. I have searched the Annual Reports of several years, and found no definite account of the area of land which has been set apart as permanent Crown forest under the Forest Act of 1888. And even in the Cape Peninsula, though I presume that Tokai, the upper plateaux of Table Mountain, and parts of Wynberg Hill are reserved, there is nothing in the Report to show it, nor am I aware of anything in the way of permanent demarcation, except the fire-lines at Tokai. So far as the Cape Peninsula is concerned, it is a great pity not to secure those parts of the mountain which are still available, demarcate them, protect them from fire, and encourage the re-growth of the indigenous tree and bush vegetation. And this should be done not only by the Government but by the Municipalities.

One of the most interesting excursions I made at the Cape was to Orange Kloof, the valley on the south side of the mountain from which Wynberg derives its water; and from which Capetown also, by means of a tunnel now under construction, will soon obtain a great increase to its supply. In the ravines of that beautiful valley are many fine patches of the old indigenous forest vegetation; and, if not in the interest of the preservation of the flora, at any rate in that of the maintenance of the water-supply, endeavour should be made to keep the area under forest and to encourage the tree-growth to spread over the scrub which intervenes between the forest patches, while at the same time to work the forests carefully in such a way as to pay their expenses while ensuring that the ground is never left uncovered. The area belongs, I believe, to the Wynberg Municipality, who already take steps to protect it from fire. I only hope they will go further, and not only save a beautiful remnant of old vegetation and ensure the permanence of their water, but form a financially profitable forest estate. These patches of old forest exactly resemble the similar so-called "shola" woods of the Nilgiris in South India. And the resemblance is not outward only, for some of the same genera, such as Ilex, Myrsine, Olea, Celastrus, Elæodendron, reappear at the Cape, and the beautiful tree-ferns (*Hemitelia capensis*) rival the *Alsophilas* of India. The chief valuable tree is the yellow-wood (*Podocarpus latifolia*), and I saw not only good saplings of straight growth, but very numerous seedlings of this valuable wood, which only wanted assistance in the shape of thinnings and the clearance of creepers to develop well.

"Hard Pear" (*Olinia capensis*), "Saffraan" (*Elæodendron croceum*), and "Assegai" (*Curtisia faginea*) are all common trees, and along the water-courses occurs the "Red Els" (*Cunonia capensis*), which seems to spread easily and grow quickly, so as to be likely to be of value in re-stocking. Among other useful trees were the "Ironwood" (*Olea laurifolia*) and one or two other wild olives, the "Beukenhout" (*Myrsine melanophleos*), the "*Zwart bast*" (*Royena lucida*), and the "Wittehout" (*Ilex capensis*), and though it is not likely that much timber can be made available for several years, there will be a good supply of fuel under careful working and possibly a fair number of pit props. Seeing that the exigencies of the water-supply preclude any complete cutting, the best system of treatment, in my opinion, for Orange Kloof (as also for the Nilgiri sholas) is that of periodic careful thinnings and a modified form of selection. Most of the species named are accustomed to germinate in the shade, but require light for their after-development.

A thinning every ten years, to remove creepers, dry and fallen wood, and a proportion of the trees, especially unsound and crooked ones, in those places where the advance growth is assured, would yield, I imagine, at least 10 tons of firewood. This means, if we assume the area to be 1,000 acres, a yield of 1,000 tons a year, the sale of which ought to pay not only the expenses of protection but be sufficient for the gradual artificial re-stocking of blanks and the construction of an export road. Possibly for the first ten years or so the returns would not be so good, but it would be worth the while of the Municipality to spend a little money yearly at first in order to form an estate that can maintain itself afterwards. If possible, the cutting and extraction should be done by the Foresters, not by the purchaser, for the treatment of natural evergreen forests requires care and professional skill. In the replanting, indigenous trees should be used as far as possible. On the drier slopes the cypress (*Widdringtonia juniperoides*), which does well, and the silver tree, which is a very fast grower and has a good wood, are obviously the best things to have, and wherever it can be grown yellow-wood should be introduced, remembering always that it prefers some shade and plenty of "humus." I visited Orange Kloof in the company of the Water-Works Engineer, Mr. Stewart, Count de Vasselot, and other gentlemen. The Forest Department itself has a small piece of old indigenous evergreen forest at Tokai, which badly requires creeper cutting and judicious thinning; and on Wynberg Hill I understand that they possess the charming silver-tree forests—at least, there was in one place near the butts a great deal of felling going on, which I was told was by them. The silver-tree apparently reproduces extremely well, especially if clear cut and if the ground, after the produce is removed, is burnt over; and its growth is so fast that it probably can be profitably worked on a rotation of twenty years for fuel. Unfortunately it suffers badly from *Dorthesia*, the white scale insect that is now ravaging the trees and orchards all over the Colony, and for which no remedy has as yet been successfully found. The silver-tree is peculiar to the Cape Peninsula, and the maintenance of the forest of it on Wynberg Hill is to be hoped for, in order to prevent the gradual extinction of one of the most beautiful and interesting trees in the world.

It is difficult, from the Reports, to judge of the success or otherwise, financially, of the Cape Forest Department, as those Reports fail to give clearly, as do similar ones in India, the balance sheet. The chief workings that are now going on are those of the Worcester Plantations of Eucalyptus for mine props and those of the

Knysna forests for general timber, and most specially for railway sleepers. The Worcester Plantation was formed in 1876 to 1878, and covers an area of 127 acres, having cost up to date £3,240. It contained in 1889-90 about 129,000 cubic feet, showing a mean annual growth of 75 cubic feet per acre. It is now to be felled for mine props, and is expected to yield a revenue of £15,000 during the next five years, when it will be allowed to grow up again from coppice. It seems a pity that the workings should not have been extended so as to give a fixed annual yield instead of a periodic one.

The workings at the Knysna, a valuable natural forest of evergreen trees with a large percentage of over-mature and unsound timber, are being carried on under a rough working plan formed by Count de Vasselot. Not having seen the forest, I am unable properly to criticize the scheme, but I should think it would have been better to have gone over the forest in a preliminary rotation, as is done at Dehra Dún, in order to regularize the growth and fit it better for a permanent working plan. Here, too, difficulties come in by the wish of the Government to make money speedily, resulting in orders to supersede the working plan, and consequently the result is that the fellings seem to be confined to the sound and good trees, the unsound being left and the less valuable kinds encouraged.

There is, no doubt, great scope for the extension of forest operations at the Cape in the demarcation and management of the old natural forests and the formation of plantations where none such exist, but if really good work is to be done, better officers and a better organization are required, together with more system and less interference. The Worcester Plantation alone shows what can be done, and considering the fine local market which exists, it would seem that the Cape Forest Department has every chance of a great future, and of rendering very great services to the Colony both materially and financially. The chief difficulties lie in the scarcity and cost of labour and in the lowness of the rainfall, the distribution of which is best seen from the map accompanying, prepared by the late Mr. J. G. Gamble, M.I.C.E., formerly Hydraulic Engineer to the Cape Government, for the Hand-book to the Exhibition of 1886. From that map it will be seen that only a few small areas have a rainfall of over 30 inches, while the central and western parts have less than 18 inches. The hill ranges are very bare, and it will be a work of the greatest value to the Colony if portions of them enclosing the head-waters of the chief rivers can be reserved, protected, and allowed to reproduce, artificial planting being resorted to in good localities to assist in restoring the old forest, which is said to have once existed. The work might ad-

SOUTH AFRICA.

Distribution of Rainfall in the year.

From the Averages of Available Observations.

vantageously be taken in hand in co-operation with the Hydraulic Department, which will, I supppose, gradually continue the good irrigation works of which the success of Van Wyk's Vley and Brand Vley and other storage works have shown the value. At Kimberley the De Beer's Mines Company have taken up an area for the formation of a forest, and are now engaged, under the Superintendent's advice, in planting up. If successful, it will be very valuable, as Griqualand West is nearly quite bare of indigenous tree vegetation.

The vegetation of the Cape Peninsula has been described by Mr. H. Bolus, in the "Official Hand-book" printed for the Indian Colonial Exhibition in 1886. To the stranger the "bush" growth is a very striking one, though in outward appearance there is some resemblance to the heath flora of Europe. On the "Flats" heaths abound, some of them very handsome, and with them are several Proteaceæ, most conspicuous of which is the "sugar bush" (*Protea cynaroides*), with large, pink, upright flowers, which is common on the lowest gentle slopes about Claremont and Wynberg. At the season of my visit, the winter, the flora was said to be at its worst; however, I found many most beautiful and interesting plants. I could not help being struck with the brilliancy of colouring in red, yellow, and white of the bulbous Oxalises, while the blue Crocus-like Babianas stud the ground between the bushes and even along roadsides. Tufts of sedge-like Restiaceæ are common, and very interesting as representatives of an order which is not usually seen in the northern hemisphere. Shrubby Polygalas and Muraltias are common and handsome, and sweet-scented Thymelaceæ and Bruniaceæ alternate with the heaths and geraniums. I was too early for the orchids, and indeed only found three species altogether, *viz.*, *Liparis capensis* on the "flats," *Disperis capensis* on the hill slopes, and the abundant *Satyrium coriifolium*, finding no *Disas* at all. So, too, I got but few of the Gladioli and other Irideæ, which are so beautiful and so eagerly searched for as ornaments of the drawing-rooms of the Cape ladies and called "Africanders." Of ferns I got several very interesting ones, one or two Hymenophylla, a curious *Schizæa* growing in tufts on the mountain, Polypodia and Acrosticha in the "Kloofs," with the tree-fern and the handsome *Todea africana*, a beautiful *Cheilanthes*, and some handsome *Pellœas*.

My return journey in the "Drummond Castle" commenced on the 16th July, and on the 4th August I again landed in England after an absence of about 2½ months, of which about 5 weeks were spent in the Cape Peninsula. The trip to the Cape and back is a

pleasant one for any one in search of a change of climate and sea air, and it is by no means expensive, as the first-class return ticket from London comes to about £63, and with care and some economy a three months' trip need not cost much more than £100. The steamers are well found, comfortable, and fitted with all the latest appliances. They have steward's bands, which play every evening, and the officers are usually very courteous and obliging. The voyage is of course rather monotonous, as land is rarely seen and stopping places are few, but the South Atlantic seas are beautiful, and the Northerner is always interested in the shoals of porpoises, the "Portuguese men-of-war," the Mother Carey's chickens, and the flight of the long-winged albatross.

Altogether, though only about five weeks in the country on the whole, it is surprising what a large amount of information I was able to gain and how interesting I found it. Everywhere I was received with the greatest kindness and hospitality, and I am sure that no one in England who wants a complete change and can spare two or three months for the purpose, would be disappointed at his reception in the Colony or with its fine climate, its beautiful natural scenery, and its lovely flora.

J. S. GAMBLE.

THE SECRETION FROM ROOTS.—Recent investigations on this subject undertaken by D. Hans Molisch have shown that the acid secretion from the roots of plants attacks organic even more powerfully than inorganic substances, not merely dissolving them, but causing in them important chemical changes. It exercises both a reducing and an oxidizing power. It stains guaiacum blue. It oxidizes tannin and humin substances, and hence greatly promotes the decomposition of humus in the soil. It transforms cane-sugar into reducing sugar, and has a light diastatic action. Plates of ivory are corroded by it. The root behaves in many respects like a fungus, specially in the fact that the fungus alters the organic constituents of the soil by definite excretions, and causes their more rapid decomposition. This root secretion does not merely impregnate the epidermis, as has been generally supposed, but is often excreted over its surface in the form of drops.—*Indian Agriculturist.*

IV. Official Papers.

A NOTE REGARDING CERTAIN INDIAN TANNING MATERIALS.

(Concluded from page 364).

"Many qualities of *Sumach*, however, are sold in this country, which contain less than 19·5 per cent., *i.e.*, the percentage of the commercial sample examined; I consider, therefore, that the following Indian tannin matters might probably find a market in Europe:—

Woodfordia floribunda (flowers).
Phyllanthus Emblica (leaves).
Terminalia belerica (fruit).
Anogeissus latifolia (leaves).
Diospyros Embryopteris (fruit).

"With reference to the above, I may say that the fruit of *Terminalia belerica* is already sold in this country, and employed as an adulterant of ground myrobalans (*T. Chebula*). The dried fruit of *Diospyros Embryopteris* is somewhat tough, and consequently difficult, if not impossible, to grind: it could only be used as an extract. The leaves of *Phyllanthus Emblica* and of *Anogeissus latifolia*, carefully dried and possibly ground, ought to find a ready sale, I should think.

"If proper apparatus for extracting the first seven tannin matters on the list were erected in India, I see no reason why a good trade could not be carried on with this country in tanning extracts. This would save the expense of carriage very materially; and Indian labour being cheap, the cost of production would also be somewhat reduced.

"I was somewhat surprised to find the flowers of *Woodfordia floribunda* contain such a large percentage of tannic acid; but it explains why the Hindus use these flowers in connection with alum as a mordant and with other dye-stuffs, *e.g.*, *Morinda*, as mentioned in the Exhibition Catalogue. It would be interesting to examine the leaves of this plant.

"The remarkable difference in the percentage of tannic acid contained in the inner and outer portions of *Terminalia belerica*

is worthy of note. In the fruit of *T. Chebula* I did not observe such a distinction of parts, but I find that on p. 500 of Crooke's *Hand-book of Dyeing and Calico-printing*, it is stated that the stone-like kernel of *T. Chebula* 'contains no tannic acid, which is mainly present in the pulp.'

"The concentration of the tannic acid in the leaves of *Phyllanthus Emblica* while the fruit contains mere traces is also remarkable. Unless, therefore, the sample of fruit examined has been damaged, or that it is wrongly* labelled, the Hindus make a great mistake in employing it as a tannin matter. From the Exhibition Catalogue I judge they always use it along with some other really useful tannin matter, *e.g.*, myrobalans.

"The utility of *Symplocos racemosa* bark does not depend upon its containing any tannic acid; and I am at a loss to account for its use as a *tan* by the natives of the Central Provinces (*see* Exhibition Catalogue, p. 156). Its ash contains a large percentage of carbonate of soda, and this may account for the mode of its employment as given, *see* p. 155, Exhibition Catalogue, under the head of *Rubia sikkimensis*, although I cannot explain the process there given; I fancy some detail has been inadvertently omitted.†

"The barks of *Ceriops Roxburghii* and *Mallotus philippinensis* seem to be poor tannin matters; and I cannot explain why the former should be described as a *valuable*‡ tan (*see* p. 151, Exhibition Catalogue).

"I shall be glad to examine such other tannin matters as you may desire to send."

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* The fruits were correctly labelled; but we have here another proof of the importance of the question of age at which fruits intended as tans should be collected. The fully ripe form of *Phyllanthus* probably contains no tannic acid; at all events, it is a pleasant fruit to eat, and is largely made into preserves. The sample examined by Professor Hummel may have been over-ripe. The unripe fruit is intensely bitter.

† The Professor's suggestion that the bark is used on account of the soda it contains, and not because of any tanning or dyeing property, is confirmed by the operation described as pursued in Manipur. At p. 155 of the Catalogue it is stated that the bark is burned and the salts contained in the ash extracted; and that it is the liquid thus obtained that is used. I do not think any part of the description has been omitted, and the process of dyeing there described was witnessed by the writer.

‡ Mangrove barks are uniformly so designated by writers on the subject. It would be curious if chemical results disproved popular favour. Probably the Indian Mangrove bark is not so good as that imported into England from other countries.

NOTE.—For Professor Hummel's Table of Analysis, *see* next page.

Estimation of Tannic Acid in various Indian Tanning Matters,

Indian Tannin matters.	Percentage of Tannic acid.	Appearance of decoctions.	*Money value per cwt compared with the Tannin materials below, at present employed by Dyers and Tanners.*									Remarks.
			Divi-divi.			Valonia cups.			Ground Sumach.			Ground Myrobalans.			
			£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	
1 *Divi-diri* (cultivated in India), ..	43 5	Pale yellow colour (turbid),	0	11	9¼		..			..			..		
2. Fruit of *Terminalia Chebula* (Central Provinces),	31·0	Pale yellow colour, ..		..			..	.		..		0	10	1	
3. Flowers of *Woodfordia floribunda* (Calcutta),	20 6	Deep reddish colour (turbid),	0	5	7	0	10	5	0	14	0	0	6	8½	
4. Leaves of *Phyllanthus Emblica*, ..	18·0	Pale yellow colour (slightly turbid), ...	0	4	10½	0	9	1½	0	12	2½	0	5	10½	4. Appears to contain some essential oil or fat.
5. Fruit of *Terminalia belerica*, ..	17 4	Pale reddish colour (slightly turbid), .. .		..			..			..		0	5	8	5. This fruit consists of two distinct portions (an outer and inner); 100 parts contain 75 4 parts outer portions and 24 6 parts inner The inner portion only contains 1·25 per cent. tannic acid.
6 *Anogeissus latifolia*, leaves (Ajmere),	15·5	Pale yellow colour (slightly turbid), . ..	0	4	2½	0	7	10¼	0	10	6½	0	5	0½	
7. Fruit of *Diospyros Embryopteris* (Calcutta),	15 0	Pale reddish colour, ..	0	4	0¾	0	7	7¼	0	10	2¼	0	4	10½	
8. Bark of *Ceriops Roxburghiana*, ..	9·3	Deep reddish colour (slightly turbid), . ..	0	2	6¼	0	4	8¾	0	6	3¾	0	3	0¼	
9. *Casuarina equisetifolia*, ...	7·5	Deep reddish colour, ..	0	2	0¼	0	3	9½	0	5	1	0	2	5½	9. This appears to contain also a red colouring matter, attracted by mordants.
10. Powdered bark of *Mallotus philippinensis*,	6·5	„ „ „ ..	0	1	9	0	3	3½	0	4	5	0	2	1¼	
11. Fruit of *Terminalia tomentosa*, ..	4·0	„ „ „ ..	0	1	1	0	2	0½	0	2	8½	0	1	3½	
12. Bark of *Mimusops Elengi*, ..	4 0	Pale reddish colour (slightly turbid), ...	0	1	1	0	2	0½	0	2	8½	0	1	3½	
13. Fruit of *Phyllanthus Emblica*, ..	traces	..		..			..			..			..		
14. *Bassia latifolia*, leaves, ..	traces	..		..			..			..			..		
15. *Baccaurea sapida*, leaves (Bengal), ..	0	..		..			..			..			..		
16. Bark of *Symplocos racemosa*, ..	0	..		..			..			..			..		16. This contains 7 4 per cent. ash, which contains 18 per cent carbonate of soda (Na_2Co_3)

The following were examined for the purpose of comparison with the above:—

Tans at present employed by Dyers and Tanners.	Percentage of Tannic acid.	Appearance of decoction.	Value per cwt.; December 1886.
			s. d.
Divi-divi, ...	44·25	Pale reddish colour (turbid).	12 0 = 3·25 pence per 100 Tannic acid per cwt.
Valonia cups, ...	31 25	,, yellow colour,	16 0 = 6·14 ,, ,, ,,
Ground Myrobalans, ...	23·0	,, ,, ,, (turbid),	7 6 = 3·91 ,, ,, ,,
,, Sumach, ...	19 5	,, ,, ,, (slightly turbid),	13 3 = 8 15 ,, ,, ,,

(Sd.) J. J. HUMMEL,
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A FUTURE FOR TANNING LEAVES.

It is scarcely necessary to comment further on Professor Hummel's remarks regarding the tans with which his report deals. He alludes, however, to one or two, with regard to which special mention has not as yet been made, and he furnishes besides interesting supplementary facts regarding some of those briefly discussed in the early paragraphs of this pamphlet. His opinion that there seems likely to be a future for the leaves of *Phyllanthus Emblica* and *Anogeissus latifolia* will be read with much interest. These trees abound throughout the drier tracts of the great central table-land of India—a region inhabited by the very poorest of her people. It remains, therefore, to ascertain the season at which these leaves possess their maximum amount of tannic acid. Should this correspond with the period of leaf-shedding—a period when miles of country become often literally strewed with them—an indefinite quantity might be collected, affording thereby both fuel to boil the liquid with, and material from which to prepare the decoction. But it is necessary to determine not only the period of the greatest yield, but also whether an extract could or could not be profitably prepared, or whether a dried powder of the leaves would not be preferable. In the same region where *Phyllanthus* and *Anogeissus* abound, *Terminalia tomentosa* (the Asna) and *Shorea robusta* (the sál) are also plentiful. Incidentally allusion has already been made to the last two trees, and the tans obtained from them shall be reverted to later

on* ; but it might be suggested in passing that as the four above-mentioned trees are rich in tanning matter, it would be worth while to ascertain whether an accidental or previously determined definite mixture of the leaves, fruits, and barks of all four would not afford a useful tanning principle.

It is next to impossible to avoid the conviction that very little skill would be necessary to make a mixture of all the tanning materials mentioned above, and after having extracted their active tanning principles, to free the half-stuff thus obtained largely, if not entirely, of any objectionable colouring agents ; nay, even to prepare on the spot chemically pure materials. At all events, it would seem desirable to ascertain if it would pay to extract a crude tannin from any one, or from a mixture of some of the four materials mentioned above. But to these might be added a fifth, *viz.*, *Woodfordia floribunda*. By the addition of that handsome shrub to the list of trees already enumerated, a characteristic feature is obtained of the vegetation of an immense portion of the jungle or open forest tracts of India. Indeed, the whole of that region might with much truth be called the tannin-yielding forests of India ; for, while the myrobalans are not so plentiful there, as the above-mentioned plants, their habitats are interspersed with the mahua (*Bassia latifolia*) and the wild mango (*Mangifera indica*). This leads naturally to the consideration of the two trees of the series with which Captain Wood has been experimenting, *viz.*, the sál (*Shorea robusta*) and the asna or asaina (*Terminalia tomentosa*). Enough has been said, however, as to the region over which these trees occur. Suffice it to add that the sál is one of the most abundant and at the same time one of the most valuable trees which frequent the subtropical forest tracts of India. It occurs in the mixed forests of the Sub-Himalayan belt from the Beas River in the Punjab to Assam ; is met with also in the eastern part of Central India, and on the central table-land from the Ganges to the Godaveri, and extends westward to the longitude of Mandla, with an outlying patch on and around the sandstone hills of the Pachmarhi Range. But there are four or five other species of the same genus which are believed to be similar in the character of their barks, and hence for tanning purposes these may be included with *S. robusta*, thus extending, by means of *S. obtusa*, and *S. siamensis*, the area of distribution from Assam through Manipur to Burma ; and by means of *S.*

* We have omitted this from our Extract, as the results of Captain Wood's work have been embodied in an article at page 51 of Vol. XV.—[Ed.]

Talura and *S. Tumbuggaia* from the central table-land of India to Mysore and Madras. Should, therefore, a prepared extract from *Shorea* bark prove of value to the tanner and obtain a remunerative price, there would practically be no limit to the supply. The timber afforded by these trees is one of the most extensively used woods in India; and it would, indeed, be hard to form even an approximate estimate of the number of trees annually thrown down for railway sleepers and other such purposes, or of the amount of bark periodically wasted. These facts may be accepted as strengthening Captain Wood's contentions, which are more or less of a local and accidental nature, *viz.*, that railway extension is causing immense numbers of trees to be felled, the barks of which are at present put to no useful purpose whatsoever.

REPORT ON THE YIELD OF CATECHIN FROM FIVE DIFFERENT QUALITIES OF THE WOOD OF *ACACIA CATECHU* IN OUDH AND BURMA.

I.

EARLY in 1889 an inquiry was started why the professional makers of *kattah* refused "Khair wood" without white spots, and only worked up those stems which were found to have white spots scattered all through their heart-wood. It was reported that the makers of *kattah* cut into the trees for the purpose of examination, and leave those stems unused which show no white spots. Much damage is thus done to the forests.

A preliminary examination in India showed that the wood with spots yielded more extract than the wood without spots. The relative yield of *kattah* was, however, not so easily determined, and I offered to inquire more thoroughly into the matter during my furlough in Europe. I have, for this purpose, been provided with samples of wood and with extracts made by the *kattah* makers in Oudh and by the cutch makers in Burma, also with printed notes on catechu and its manufacture in India.

I find, also, much information on record in Europe about cutch or catechu, also gambier or *Terra Japonica*, but much uncertainty exists about the composition and properties of the principal compounds, catechin and catechu tannin. No record exists of any examination of the wood which yields the cutch.

The active principle of cutch is the tannin, that variety of tannin which is called catechu tannin, and which forms a greenish brown compound with ferric salts. As a rule there is, however, also catechin in the cutch. *Kattah*, which is used in India for consumption

with betel and lime, has catechin for its active principle. Pure *kattah* is almost entirely catechin. Catechin and catechu tannin are similar in composition, and resemble each other in some of their properties. Catechin is easily changed into tannin or a similar substance, but not the reverse. Catechin is soluble in hot water, and practically insoluble in cold water. The tannin dissolves in water of any temperature.

This different behaviour towards cold water enables us to separate the two substances from each other. Yet this operation is not as easy as might be thought, because the tannin in the solution retards the separation of the catechin. After long standing of concentrated extracts of the *Acacia Catechu* wood, which are mixtures of catechu tannin and catechin, all the catechin is not separated. Some appears always to remain in the final residue with the tannin.

Two extracts, A and B, were made in Burma from the woods named A and B, and sent as prepared samples of catechu with the wood specimens. I treated these samples very carefully with acetic ether and with hot water, but I was only able to obtain 6 per cent. of catechin from them, whilst catechu is generally supposed to contain more catechin than that.

When trying to extract and crystallize catechin out of small quantities of the wood of *Acacia Catechu*, complete failure is the result if the solutions are diluted, and if the wood is boiled and treated for a long time with the object of making the extraction complete. A rapid treatment and concentrated solutions are indispensable. The following method may be followed :—

About two ounces of finely cut wood are boiled for half an hour with 20 times their weight of water. The decoction, freed from the wood, is reduced in bulk on the water bath until it begins to become syrupy, or until it is estimated to contain about 6 per cent. of catechin. The liquid is then allowed to stand in a cool place for four days, or at the most five days. The catechin never separates at once. Even cooling to freezing point has no effect, but after standing a night there is separation in most cases. When the proportion of catechin is small in comparison with catechu tannin, it may happen that it takes two days until the separation begins, and in such cases it will be good to let the liquid stand five days. Stirring the liquid is advisable. Immediate crystallization of catechin is sometimes effected by the addition of some ready crystallized catechin to the over-saturated solution and stirring. The addition of a drop of a mineral acid has also sometimes the effect of making the catechin separate. The chief agent in this process of separation is, however, time. After enough time has been allowed, the

catechin is brought on a filter and roughly washed with cold water. The catechin is then dried by exposure to dry air. The air must not have a higher temperature than 40 degrees Centigrade. Heat injures or destroys the damp catechin. The accounts of the manufacture in India agree also about the drying of the product by air and not by artificial heat. After the catechin was completely dried in warm air I left it for some time in the desiccator. When I weighed it, it had reached such a state of dryness that it kept increasing slightly in weight on the scale pan through absorption of moisture from the air.

Once the catechin is thus separated and dried it remains unchanged for years, as is shown by the constancy of the *kattah*. The pure catechin, after being dissolved in hot water, separates immediately on cooling. There is no such delay as in the case of mixtures of catechin and tannin. When dissolved in eight times its weight of hot water and then cooled, the catechin separates in such numbers of microscopical crystals that the liquid becomes stiff.

At the same time we notice how easily the catechin is decomposed whilst in solution. The recrystallization of catechin yielded, on the average of three trials, only 68 per cent. of the original weight. The original catechin was air-dry, and the second catechin was dried in the desiccator and was a little purer, but still the actual loss of catechin through the simple solution in hot water, crystallization, and drying cannot be less than 25 per cent.

If mere crystallization of catechin by means of hot water causes such a loss, it is not astonishing if the decoction of the wood with water does not yield the complete amount of the catechin.

The filtrate from the catechin is evaporated on the water bath and the residue weighed. We thus know how much soluble matter was extracted from the wood, and find the proportion of catechin in the whole extract.

Further treatment of the residue with the aid of acetic ether yielded often a little additional catechin. But it was not enough to affect the result much, and as in some cases only the merest trace of catechin was obtained from the residue, the removal of catechin by the main process appears so far satisfactory.

I made now with each of the woods a further trial. I treated a portion of finely-cut wood with much hot water, so as nearly to exhaust all soluble matter. I desiccated the extract and weighed the residue. From this I obtained the maximum percentage of solubles in the wood. During the rapid extraction of catechin I obtained less total soluble matter, but I have also placed the figures on record for the purpose of comparison.

From the average proportion of catechin in the extracts and from the maximum yield of extract of each wood, we calculate then the maximum yield of catechin of each. The following samples of the wood of *Acacia Catechu* were examined :—

Oudh No. I.—Reported by the *kattah* makers as unfit for making *kattah*. One in a thousand of the large pores of the heart-wood filled with white substance.

Oudh No. II.—Reported as good for *kattah*. About one in six of the large pores filled with white.

Burma A.—Reported by the Burmese as having no white spots. Has no spots, but cracks filled with white matter (*kersal*).

Burma B.—Reported by the Burmese as having spots. One in twenty of the pores white.

Burma C.—Selected by the Forest Officer as having distinct spots. A very beautiful specimen with large white spots. About one in every three pores white.

The following Table shows the amount of extract obtained at different trials. The extract was of such dryness that it just began to increase a little in weight on exposure to the air :—

Wood.	Per cent. Extract.	Maximum per cent.
Oudh No. I., ...	6, 9, 10, 14, ...	14
Oudh No. II., ..	4, 15, 15, 16, 17, 19, 23, 24,	24
Burma A, ...	12, 15, 17, ...	17
Burma B, ...	14, 15, 16, ...	16
Burma C, ...	16, 16, 20, 20, ...	20

The following Table shows the amount of catechin separated out of the woods. Percentage of catechin in the extract :—

Wood.	Percentage of Catechin in the Extract.	Mean per cent.
Oudh No. I., ...	33, 38, ...	36
Oudh No. II., ..	27, 31, 38, 64, ..	40
Burma A, ...	9, 19, ...	14
Burma B, ...	17, 46, ...	31
Burma C, ...	21, 36, ...	28

From the above we calculate the total yield of catechin in these five woods as follows :—

Oudh No. I., ..	.. 5 per cent. catechin from the wood.
Oudh No. II., ..	.. 9 „ „ „
Burma A, ..	.. 2 „ „ „
Burma B, ..	.. 5 „ „ „
Burma C, ..	.. 6 „ „ „

We have thus ascertained the following facts. Woods with white spots are richer in extract and richer in catechin than those without spots. From all woods catechin may be extracted by the above-mentioned method with hot water. The Oudh woods are specially favourable for the manufacture of catechin. This explains why the manufacture of *kattah* has specially developed in Oudh. *Kattah* should be pure catechin, containing as little tannin as possible.

I examined *kattah* from Oudh, which was bought in the bazaar at Dehra Dún, North-West Provinces. It consisted of rectangular pieces about 2 inches long. The pieces are earthy inside, and they have all round their surface a hard crust, one-eighth of an inch thick, rich in tannin.

For the determination of catechin I only took the inner soft portion of the pieces. Even this inner purest portion contained 3 per cent. of wood splinters and sand. The recrystallization yielded the following proportion of catechin :—

34, 38, 48 per cent., or on average 36 per cent.

The *kattah* which was manufactured for the Oudh Forest Department and sent to me with the samples of wood of *Acacia Catechu* early this year, yielded 62 per cent. catechin. It was therefore much richer and purer than the *kattah* of the bazaar. But still it contained also 4 per cent. of wood splinters and 2 per cent. of sand.

It would now appear advisable that in the Oudh forests both classes of trees should be utilized for the manufacture of *kattah* and of catechu. The inferior trees might be treated separately. If the manufacture could be centralized it would be possible to use machinery for cutting up the wood, and to carry on the whole work on a large scale and with improved appliances. That portion of the extract which would remain over after the separation of the catechin could be utilized for making common cutch or catechu for the European market.

In Carl Feuerlein's factory, near Stuttgart, South American woods are used for making extracts of vegetable dyes, one of them very similar to catechu. The extraction is effected with hot water under ordinary pressure, and the decoctions are concentrated at a lower temperature in vacuum pans. The vacuum increases the outturn, because it prevents much of the dyeing material from being decomposed. The imported Burmese cutch is subjected to a purifying process, and also finally evaporated in vacuum pans. It is, therefore, possible that vacuum pans would also effect a saving in the manufacture of cutch in India.

12*th March*, 1890. H. WARTH.

II.

On the 12th of March last I had the honour to report on the amount of catechin and tannin contained in the wood of *Acacia Catechu* from Oudh and from Burma.

I found from 5 to 9 per cent. catechin and 10 to 15 per cent. tannin when using two or three ounces of the wood for each trial. To test my method further I have now treated larger quantities, namely, 50 lbs. of wood No. I. from Oudh and 30 lbs. of supposed No. II., which had both been sent to me by the Oudh Forest Department. I cut the wood on the lathe into shavings of $\frac{1}{16}$th inch thickness, and boiled two or three times with water. The liquid so obtained I concentrated over the fire and finally over the steam bath, until it was dark brown and thick, and began to form skin at the surface. I then let cool, and afterwards stirred it up with a trace of ready-made catechin. Finally, it was allowed to stand for five days in a cool cellar, during which period the catechin crystallized out.

After dilution with cold water I put the liquid through the filter press. The cakes of catechin were then dried in the open air at ordinary temperature. The liquid which flowed off from the catechin was put to evaporate until it was nearly solid. It was then poured into a paper mould, in which it solidified. Of the produce so obtained I have the honour to submit samples according to the subjoined list.

The Oudh wood No. I. is the poorer quality, from which the Oudh local kattah makers declared they were unable to make kattah or impure catechin. I obtained 3·7 per cent. of dry pressed catechin (the purest kattah), and 12 per cent. of pure hard catechu tannin.

The 30 lbs. of Oudh wood No. II. were sent by the Forest Department evidently by a mistake. Instead of being the rich kind of wood with a large percentage of catechin, and recognized by white spots, they were a poor kind of wood, in which I could recognize but the merest trace of white spots. When boiling this wood I also used an iron vessel, which I thought was not dangerous, because it had been newly tinned, but the tinning was insufficient, and iron rust got into the liquid. Iron is such a great enemy in the manufacture of catechin that iron vessels, whether tinned or galvanized, will have to be absolutely avoided. In consequence of this mishap with the iron, the supposed wood No. II. yielded me only 2 per cent. of catechin, besides 11 per cent. of catechu tannin, of both of which I have the honour to submit samples. According to my former trials on a small scale, good wood No. II. might have yielded me 9 per cent. of catechin and 15 per cent. of tannin.

No serious mishap, however, took place with the 50 lbs. of wood No. I., and it was of chief importance to prove the usefulness of this wood No. I. for catechin manufacture, because the local makers refuse to use the wood, although it grows with the other in the same forests, and is of the same species, *Acacia Catechu*.

I have now the honour to propose an improved method of making catechin and tannin in the North-West Provinces.

Whilst, according to the reports, the local kattah makers cut into the heart-wood of the trees, and leave those trees standing injured and unused which have no white spots, it will be in the interest of the Forest Department if both trees No. I. and No. II. are used up at the same time for the same purpose.

The smaller yield of catechin from the trees No. I. will be compensated for by the manufacture of tannin for the European market. This catechu tannin will fetch its price there as a catechu of superior, uniform, and always trustworthy quality. From the wood No. II. the improved method will also utilize a large quantity of tannin or pure catechu, which has hitherto been wasted. The people pour their mixture of tannin solution and catechin upon sand, when the catechin remains and is dried into cakes, whilst the tannin soaks away into the sand.

The catechin itself is also very impure. Taking the whole pieces of 6 lbs. of kattah, softening them with cold water, and putting them through the filter press, I obtained 59 per cent. of air-dry catechin cakes, 25 per cent. of tannin in solution, and 16 per cent. of sand. For the imperfect and wasteful method of filtering through sand, it is proposed to substitute the filter press. The filter press is now universally introduced for separating solid matter from liquids, and it is of special utility in the manufacture of catechin. The separation of catechin from the strong tannin solution by ordinary filtration is very difficult, and dilution causes loss of catechin, because the latter, on standing with water, becomes converted into a soluble substance. The filter press, which effects the separation of the catechin rapidly, is therefore quite indispensable. Its application alone will give quite a new start to the process of catechin extraction.

But the cutting up of the wood by machinery will also afford a great advantage over the present method of cutting it into coarse chips by hand. If we add for earthen pots large copper vessels for boiling the thin shavings of the wood and for concentrating the liquid, we have all that is required for the economical production of catechin on a large scale.

The final desiccation of the tannin solution, from which the cate-

chin has been separated, would also be a difficult process if done in the ordinary way. It would require many hours of stirring, because the hot thick liquid forms skin on exposure to air, and it is only constant tearing of the skin which renders evaporation possible. For this part of the process it is therefore advisable that vacuum pans be used. By their means the evaporation will be accelerated, and the injury done to the tannin by the boiling will be reduced to a minimum.

The complete apparatus for the improved process does not cost much. Mr. J. Gyiketta, an expert for dye and tannin extraction, has given me the following figures:—

A manufactory for extracting 10 tons of wood daily consists of—

	£
2 steam boilers, each of 1,000 square feet heating surface, ...	1,000
Setting up and chimney, ...	250
1 steam engine of about 100 H.-P. (or a turbine if there is water-power), ...	600
2 wood-cutting machines, ...	200
6 copper vessels for extraction, ...	450
2 copper vacuum pans, each with 500 square feet heating surface, ...	600
1 air pump for the vacuum pans, ...	250
1 filter pump of 100 square feet surface, ...	200
Reservoirs, ...	50
Total, ...	£3,600

This sum is intended for Europe, and equals about Rs. 50,000 in Indian coin. No provision is made for sheds, houses, wells, &c., and there will be the cost of transport to India, and to the site in the North-West Provinces. Many spare parts of machinery will also be required, to avoid delay in repairs. But all this and every possible expenditure, including the deputation of an expert for two years, will be more than met, if we assume a total cost of one lakh of rupees.

A factory, costing one lakh of rupees will in 200 working days per year produce about 3,500 maunds of catechin, and 7,500 maunds of tannin dye. The value of the former in India will be at least Rs. 1,10,000, considering its great purity, and the value of the latter in India for export to Europe will be about Rs. 90,000. The total value of produce per year will be about Rs. 2,00,000. The annual produce of the factory will therefore be worth twice the original cost of the factory.

The conditions are therefore very favourable, and there is little doubt that private enterprise would readily step in if the case was made known, and it would be easy to overcome all competition and to obtain the monopoly for the manufacture.

Catechin or kattah is, however, an article of every-day use in almost every household in India, and there are reasons why it would be better that the Government of India should obtain this monopoly. Moreover, the Government are either in possession of the *Acacia Catechu* forests, or else they have the control over the production and supply of the wood ; it is therefore quite suitable that the Government should undertake the work.

I would be obliged if you would be so kind and permit my coming to London before my return to India, that I may personally report on the subject, and, if you advise, communicate with consumers of catechu and manufactures of dyewood extracts in England for the purpose of proving still further the advisability of the proposed work.

I have the honour also to enclose the account of my expenditure from 5th March last. It amounts to 275 marks 78 pfennige, which equals £13 9*s*. at to-day's rate of exchange.

List of Samples sent on the 9th of August by post *viâ* Hamburg to the Under Secretary of State.

Wood of *Acacia Catechu*, No. I., one piece.

Wood of *Acacia Catechu*, No. II., one piece.

	Grammes
Indian kattah, ...	125
Indian kattah, taken through the filter press, ...	600
Catechin from No. I wood, ...	560
Catechin from No. II. wood, ...	290
Tannin from No. I. wood, ...	770
Tannin from No. II. wood, ...	350
Total weight of kattah, catechin, tannin,	2,695

The whole was reported in the customs sheet as 3 kilogrammes catechu.

CANNSTATT, WÜRTEMBURG,
11*th August*, 1890. H. WARTH.

Y. Timber Market.

STATEMENT OF AVERAGE SELLING RATES FOR TIMBER AND BAMBOOS FOR THE QUARTER ENDING 30TH SEPTEMBER, 1890.

At Meerut.

	Rs. A. P.		Rs. A. P.
Sál 10′ tors (poles), per score from	10 0 0	to	20 0 0
Sál karis, 12′ × 5″ × 4″ „ „	25 0 0	„	40 0 0
Sál bed-posts, 7′ × 2½″ × 2½″ „ „	7 8 0	„	12 10 0
Bamboos of 9′ to 10′, per 100 score, „	25 0 0	„	80 0 0

At Cawnpore.

Sál 10′ tors (poles), per score from	6 0 0	to	7 0 0
Sain karis, 12′ × 5″ × 4″ „ „	12 0 0	„	14 0 0
Sál bed-posts, 7′ × 2½″ × 2½″ „ „	4 0 0	„	5 0 0
Bamboos of 9′ to 10′, per 100 score „	35 0 0	„	50 0 0

At Bulandshahr.

Sál 10′ tors (poles), per score from	0 0 0	to	0 0 0
Sál, sain, &c., karis, 12′ × 5″ × 4″, „ „	0 0 0	„	0 0 0
Sál bed-posts, 7′ × 2½″ × 2½″ „ „	0 0 0	„	0 0 0
Bamboos of 9′ to 10′, per 100 score „	55 0 0	„	60 0 0

At Pilibhit.

Sál 10′ tors (poles), per score from	40 0 0	to	70 0 0
Sál karis, 12′ × 5″ × 4″ „ „	30 0 0	„	40 0 0
Sál bed-posts, 7′ × 2½″ × 2½″ „ „	5 0 0	„	6 4 0
Bamboos of 9′ to 10′, per 100 score „	60 0 0	„	100 0 0

At Bareilly.

Sál 10′ tors (poles), per score from	5 0 0	to	10 0 0
Sál karis, 12′ × 5″ × 4″ „ „	50 0 0	„	60 0 0
	25 0 0	„	35 0 0
Sain karis, 12′ × 5″ × 4″ „ „	25 0 0	„	40 0 0
Sál bed-posts, 7′ × 2½″ × 2½″ „ „	10 0 0	„	15 0 0
Bamboos of 9′ to 10′, per 100 score „	50 0 0	„	137 8 0

At Moradabad.

Sál 10′ tors (poles), per score from	20 0 0	to	22 8 0
Sál, sain, &c., karis, 12′ × 5″ × 4″, „ „	50 0 0	„	60 0 0
Sál bed-posts, 7′ × 2½″ × 2½″ „ „	12 8 0	„	15 0 0
Bamboos of 9′ to 10′, per 100 score „	50 0 0	„	150 0 0

S. Eardley-Wilmot,

Offg. Conservator of Forests, Central Circle, N.-W. P. and Oudh.

VI. Notes, Queries and Extracts.

Forestry in the Colonies and in India.

(*Continued from page 372*).

The planting up of a few hundred acres per annum is all very well, but it does not constitute forest conservancy on a scale in due proportion to the extent of the Colony, especially as many of the exotic trees which have been planted are not likely to prove useful as timber trees. The principal part of the Conservator's energy should be directed towards the selection and demarcation of further and more extensive forest reserves suitably distributed over the Colony, such reserves amounting ultimately to an area sufficient to meet the requirements of the Colony. In some parts of the Colony it is probably too late to carry out this policy, while in others numerous areas are as yet unoccupied. Here the selection of reserves should precede the advance of colonisation. Once the tide of occupation has fully entered a district, the setting aside for forest purposes of suitable blocks becomes more difficult every day.

On the whole, then, the action so far taken in South Australia seems far below what the necessities of the Colony demand.

The Conservator, Mr. Brown, mentions in his last report that in some of the State forests large numbers of seedlings of the indigenous species had sprung up, in consequence of their having been protected against grazing for three years, and he urges that similar protection should be afforded on a more extended scale, until the young trees are of a size to render them safe against injury by stock; but he also adds that his endeavours in this direction have, so far, been unsuccessful, as he has not been able to induce the Government to take his views on the subject.

The financial results of the, so far, limited operations in South Australia are satisfactory, and there is no reason to believe that more extended operations will be followed by a less favourable balance sheet of the Forest Department. At any rate, any outlay in this respect can only be infinitesimal when compared with the increasing sums which the Colony will have to send out of the

country every year if it neglects to establish a sufficient area of permanent forest estates without loss of time, and to manage them on economic principles.

(*b*). New South Wales.

The forest law forms Part VI. of Act XVIII. of 1884—"An Act to regulate the Alienation, Occupation, and Management of Crown Lands, and for other purposes."

It provides :—

(1). The Governor may proclaim any areas of Crown lands to be "State forests," or reserve from sale any such areas as "timber reserves."

(2). State forests may be divided into blocks : until so subdivided, all existing forest and timber reserves may be reserved from sale, lease, or otherwise, as the Minister may think proper.

(3). The Governor may dedicate or reserve any State forest, or any portion thereof, for a specified period for the conservation of timber, and such forest shall not, during the term of reservation, be open to timber or other licenses or permits.

(4). The Governor may frame regulations for the issue of licenses or rights to cut and remove timber on State forests or timber reserves, or to remove any other produce.

Section 133 of the same Act prescribes penalties for offences against the various provisions of the Act :—

For a first offence,	a penalty not exceeding		£5.
,, second ,,	,,	,,	£10.
,, third or subsequent		,,	£20.

In accordance with these provisions an area of 5,656,831 acres, equal 8,839 square miles, had been declared State forests and timber reserves in 1887.

It is evident that there is not the character of permanency about these arrangements, because the law provides for the division of the State forests into blocks, which may be sold or leased afterwards. Areas reserved under such conditions do not partake of the character of permanent forest estates ; hence an amendment of the law seems highly desirable.

I understand that about 10 per cent. of the area of the Colony may be classed as forests. These areas are said to be situated principally on the eastern slopes of the hill ranges running more or less north and south, at some distance from the east coast of New South Wales. I am not in a position to indicate the distribution

of the existing reserves. They amount to not quite 3 per cent. of the total area. It seems desirable that the Government should, as speedily as possible, decide what portion can be permanently maintained as forest estates, and then proceed to constitute further permanent State forests in suitable localities, so as to secure a sufficient percentage of the total area being permanently maintained under wood.

New South Wales has the advantage of extensive coal deposits, so that localities within reasonable distance of water or railway carriage can be supplied with coal fuel. Large areas, however, cannot be so reached, and these must rely on locally-grown wood fuel, while extensive quantities of timber will always be wanted; so that the maintenance of forests is of considerable importance, apart from the fact that they may be wanted for climatic and other reasons. In the latter respect I may here mention that in New South Wales the clearing of the catchment basins of rivers is said to have been followed by a more continuous flow of water in the streams lower down. This is diametrically opposed to the experience gained in other parts of the world, and I confess that I am somewhat sceptical in regard to these statements; at any rate, the phenomenon requires further careful investigation before it is finally accepted as correct. Possibly the tramp of the cattle along the water channels may gradually have hardened their bottoms, so that a smaller percentage of the water soaks into the ground and disappears.

(*c*). Victoria.

Victoria is, in many respects, the most instructive of the Australian Colonies as regards forest policy. It is situated between the 34th and 39th degrees of southern latitude. Although it appears to occupy only a comparatively small corner of the continent, its area, 87,884 square miles, is really about equal to that of England and Scotland. It is divided into two parts by a range of mountains called the Main Divide, which runs from east to west, nearly through its whole length; the southern part comprises a somewhat smaller area than the northern. The elevation of the Main Divide reaches over 6,000 feet in the eastern, but barely 3,000 in the western part, the average elevation having been estimated at 3,000 feet. Various spurs run from this centre chain to the north and south, dividing the country into a series of drainage basins. The rivers on the south of the Main Divide find their way, after comparatively short courses, into the Southern Ocean. Those in the north join the Murray River, with the exception of some in the north-western part

of the Colony, which lose themselves in lakes and swamps, the overflow from which is absorbed by the porous soil of low tracts.

The rainfall of the Colony, being governed by its physical configuration, is estimated to amount to about 40 inches on the mountains and high tablelands, and at from 25 to 40 inches, according to circumstances, in the southern half of the country situated between the sea and the Main Divide. On the north side of the Main Divide the rainfall is smaller, being estimated at about 20 inches in the valley of the Murray, and going down to about 10 inches in the north-western part of the Colony.

The temperature differs considerably with situation and rainfall. While the higher hills have a perfectly temperate climate, the lower lands are more or less sub-tropical with a mild winter. Occasionally northern winds occur, which are cold in winter and dry and hot in summer. The Victorians are fond of claiming for their country "the finest climate in the world."

Baron Ferdinand von Müeller, K.C.M.G., the celebrated botanist, who has been at work in Australia since 1847, mentions a series of distinct climatic regions in Victoria, of which I may mention the following three:—

(1). The almost frostless tracts with a considerable rainfall, such as the low lands along the eastern and southern coasts, fit for sub-tropical plants.

(2). The dry regions, with a small and precarious rainfall and great summer heat, such as the north-western districts, fit for plants belonging to arid zones.

(3). The upland region, with snowy winters, such as the sub-Alpine tracts, fit for plants of cold zones.

Before proceeding to indicate the forest policy of Victoria, it will be useful to mention a few statistical data referring to that Colony. Victoria had in 1888 a population amounting to 1,090,869 people, which is equal to 13 inhabitants per square mile. There were also—

	Acres.
Horses, ... =	323,115
Horned cattle, ... =	1,370,660
Sheep, ... =	10,818,575
Land under cultivation, ... =	2,576,405

These data show that a high percentage of the total area must be put to profitable use, especially for grazing. About 40 per cent. of the area has been alienated, leaving about 60 per cent. at the disposal of Government.

There is abundant evidence available to show that the pro-

servation of a portion of the area under forest is considered essential for its indirect effects, but want of space prevents my going into the details of the case. At any rate, there can be no doubt that timber and other produce is wanted in enormous quantities, which for years past could not all be supplied from the forests of the Colony. The average annual imports of timber amounted during the years 1884-88 to £968,946.

I have experienced considerable difficulty in getting a precise idea of the present distribution of the forests. As far as I could ascertain, the principal wooded areas are situated in the eastern half of the Colony and in the hill ranges near Cape Otway. The western half is more thinly timbered, and in the north-west an area of some 10,000,000 acres is covered with mallee scrub, consisting of dwarf eucalypts, which reach a height of about 12 feet.

The principal constituents of the timber forests are some forty species of eucalyptus, of which eleven are mentioned as specially useful. In addition there are a considerable number of acacia species, of which the Blackwood tree (*Acacia Melanoxylon*) and the tan wattle (*Acacia decurrens*) are the most important.

I am not in a position to state what the area now under forest amounts to. Special inquiries were made in this respect between the years 1874 and 1878 at the request of Her Majesty's Secretary of State for the Colonies. The replies to this request were brought together in a digest prepared by Mr. Julian C. Rogers, Secretary to the Institute of Surveyors. From this digest it appears that about 40,000 square miles were under wood in, say, 1875, which is equal to 46 per cent. of the total area. This estimate, it appears, included the area covered with small eucalypts and all the mallee scrub, which together constitute almost one-half of the area stated to be under wood. Under these circumstances, the returns were of some value as regards supply of firewood, but less so in respect of that of timber.

The same returns gave a most melancholy account of the manner in which the forests were treated fifteen years ago. They say:—

"The amount of timber is diminishing owing to clearings for settlement, ordinary home consumption, and bush fires. . . .

"As early as 1868 attention was called by a specially appointed Board to the wastefulness and improvidence of the prevailing system. Only the prime parts of trees were utilised. Immense numbers of standing trees were killed owing to the practice of stripping from them large sheets of bark to cover, perhaps, a more temporary hut. The Committee called attention to the growing

scarcity of timber for props for mining purposes and the necessity of measures to secure a permanent supply. The Committee also recommended the planting of suitable pine trees in the forests, and expressed a belief that within a short period the native supply would supersede the necessity for importing that timber for which at present they are wholly dependent upon other countries or Colonies. They recommended the abolition of the existing, and the introduction of a new, licensing system in the State forest reserves.

"In 1872 the Royal Commission on Foreign Industries and Forests state that urgent action in reference to this subject is needed becomes daily more evident. The threatened scarcity of timber in the gold-mining districts especially is referred to in terms of undisguised alarm, and the signatories recommend the early appointment of a Central Forest Board, the establishment of State nurseries, the distribution of seedling to selectors, and the planting of reserves denuded of indigenous timber." . . . .

Thus, then, stood matters, say fifteen years ago. The Government of Victoria had full warning of what was going on in the forests, and it will be easily understood that it felt the desire to meet the existing evil. Let us see with what success.

In 1876 an Act was passed, called "The State Forest Act," which was to be read with and construed as part of the Land Act, 1869.

This Act provided—

(1). For the appointment of Local Forest Boards, which were to have the care of reserves and other Crown lands that might be assigned to them by the Governor in Council.

(2). For the appointment of Foresters by the Local Forest Boards, with the approval of the Minister, such Foresters to have the power of Crown land bailiffs.

(3). For the promulgation by the Governor in Council of regulations prescribing the duties of the Local Forest Boards.

This Act had evidently for its object to entrust local boards in various parts of the country with the management of the areas which might be set aside for forest purposes from time to time. I am informed that it was never really put into force, though it is said not to have been repealed.

In 1884 a new Land Act was passed, which provides, amongst others, for the following matters :—

(1). The formation of State forests.

(2). The formation of timber reserves.

(3). The management of both.

(4). The management and disposal of timber and other forest produce on the unalienated Crown lands not included in the State forests and timber reserves.

Under this Act the State forests can only be alienated with the consent of the Governor in Council. The timber reserves shall not be alienated in the first instance, but as the several parts become denuded of timber they may be added to the pastoral or agricultural lands—in other words, thrown open to selection. The timber reserves are, therefore, only temporary reserves.

The forests generally are worked under the license system, regulated by rules made under the Act. There are licenses for felling, splitting, clearing undergrowth, the erection of saw mills, grazing, removal of wattle bark, &c. For each of these licenses certain fees are paid.

Penalties are provided for breaches of the law or any regulations issued under it. As far as I am aware, no rights by private persons are recognised in the Crown lands ; hence the Act does not provide how such rights are to be dealt with.

On the whole, I think the existing law, if applied in a proper spirit, would enable the Government of the Colony to deal efficiently with the forests ; and the question which now interests us is whether, and in how far, effect has been given to the policy which is indicated in the Act. To answer that question thoroughly it would be necessary to inquire into the matter on the spot. This being out of the question, I must fall back upon the report of an expert, Mr. F. D'A. Vincent, which he wrote and submitted to the Governor of the Colony after a visit of some months to Victoria in 1887. Mr. Vincent is a trained Forest Officer of known ability, who has served in the Indian Forest Department since 1873. He gives the following description of forest management as existing in 1887 :—

The areas of State forests and timber reserves stood as follows in 1887 :—

				Acres.
State forests,	...	...	...	664,710
Timber reserves,	...	...	...	690,732
		Total,	...	1,355,442

equal to 2,118 square miles, or about 2 per cent. of the area of the Colony. The timber reserves, or one-half of this area, are only temporarily reserved, so that the more permanent State forests occupy only 1 per cent. of the area of the Colony. It also appears

that changes have, from time to time, been made in the State forests, some areas having been given up and others gazetted instead. This detracts considerably from the character of permanency.

Some plantations have also been made, the total area being under 2,000 acres : they are planted with wattles, blue gums, and a variety of exotic trees.

Mr. Vincent visited a number of the State forests, timber reserves, and other forest lands, and he draws a rather gloomy picture of their condition. This is what he says, for instance, about the Wombat and Bullarook forest (area 105,000 acres):—

"This is said to have been originally a magnificent forest, chiefly of messmate or stringy bark, the timber being of the very best class. . . . . Enormous quantities have been sent away to Melbourne, Sandhurst, and Ballarat. . . . . There were thirty-six saw mills at work in 1884. . . . . The splitters have cut more timber than even the saw-millers. . . . The good timber is now almost all worked out, except in central localities in the southern half of the forest. In the portion which I visited there are only second-class trees with a certain number of bigger ones, which have been left for some fault. There has been little or no reproduction, the whole of the young trees have been burnt, and there are no middle-aged ones coming on to yield timber some twenty or forty years hence.

"The useless waste and destruction that has been going on in this forest for the past thirty years defies all description. The saw-mill fellers and the splitters have been allowed to go in and cut when and what they chose. Generally the fellers took one log out of each tree, leaving the rest, which, although not quite so good as the butt end log, still consisted of first-class timber. The splitters, as often as not, left trees to rot where they had fallen, without even taking out one log, on finding that the wood did not split well. Even if they did split, at least three-fifths of the timber in the trees was wasted. Subsequently, when the wood thus left on the ground was fired, a fierce blaze occurred, which killed or rendered useless almost as many trees as had been felled . . . . . The selection of the State forests has not been well made here, for some of the best forests have been left outside, and inferior growth taken up for the reserve."

Similar accounts are given of many other forests, though the waste may not be so great in every case as that said to have taken place in the Wombat and Bullarook forest.

Mr. Vincent remarks on the management generally in the following terms :—

"From what I have said above, it will be understood that I am very unfavourably impressed with the present state of the forests. Wherever I went they told me the same story of neglect and waste, and I feel sure that no one could help arriving at any conclusion but that mismanagement has been rampant everywhere and disastrous in its effect. In newly-settled countries, which are largely covered with forests, one often finds great extravagance and waste. But as it has long been known that the area of good forest in the Colony was limited, and that supplies of timber were running short, I am surprised that some effectual measures have not been taken to prevent further waste. The present arrangements are quite puerile, and so ill-conceived that they can scarcely be seriously discussed. The boundaries of the State forests and timber reserves have been selected with little regard for the real requirements of the case. Little care, so far as my inquiries go, has been taken to select as State forests or timber reserves the best forest, and that most conveniently situated for export. There are numerous instances of the best forests being given up to settlers, or kept as Crown land for splitters to work in . . . . The terms on which licenses are issued are chiefly to blame for the waste and destruction which have gone on everywhere . . . . . In Victoria the license-holder has virtually the right to cut as many trees as he chooses, to remove them or abandon them . . . . Little restriction is shown in the number of licenses issued. The saw-mill licenses are issued freely by the Secretary of Agriculture, provided the proposed site of the mill is not too close to that of another man, and work is allowed to go on all over the forest, as if the sole object of Government was to get rid of all the wood as rapidly as possible, and there was no such thing as a future . . . . Another reason for the complete disorganisation which exists appears to come from forest operations not being directed by a trained Forest Officer. There is no superior officer to visit the different forests periodically, to organise the work, and to submit annual progress reports to Parliament . . . . . The Secretary for Agriculture, handicapped as he has been by want of experience in forest work, has done some good. Unfortunately, his other work has denied him the advantage of going round on frequent tours of inspection, and he has thus been unable to go into the practical forest work with his subordinates. The absence of an inspecting officer has been very unfortunate for the foresters, who, when appointed, had no previous experience. They have had to work for years without advice or assistance."

As regards the future supply of timber, Mr. Vincent says :—

" It appears likely that Gippsland will soon be the only large source of supply. This being the case, the future can only be regarded with concern, even if the demand for timber in the future is to be no greater than at present. As, however, a large increase in the consumption may be safely anticipated, taking into account the natural increase in population, the present rapid extension of quartz mining, and the decrease of timber on private lands, there is likely to be a great scarcity of timber in the next ten or fifteen years. Already the mining community complain of the great increase in the price of firewood and timber and the neglect which the large areas of Crown lands in the vicinity of the mines receive. On some mines firewood costs now 30 to 40 per cent. more than it did five years ago, and there is a universal complaint that the timber now supplied for props, laths, &c., is very inferior and immature."

Mr. Vincent then sums up as follows :—" The immediate causes of this are the bad license system, the ill-arranged classification of State forests, timber reserves, and Crown lands, the absence of professional foresters to direct operations, and the neglect to reserve the best natural forests. The officials in charge of the forests have often protested against the present license system, explaining that the forests are being rapidly ruined. They explain that they cannot protect the forests from theft, and yet no change is made. Why? Because Parliamentary influence is brought to bear by the saw-mill owners and by the splitters, who are determined that no change shall be made in the present arrangements. Both these classes are powerful, the splitters especially. When an attempt is made by the foresters or the Secretary of Agriculture to do justice to the forests and to protect them, the persons affected organise deputations, questions are asked in Parliament, and concession after concession is made. There is little hope of the forests ever receiving proper treatment until the forest question is made a national one, and removed from the arena of party politics. The decision as to the future rests entirely with the country. The question is : Are the electors prepared to allow the saw-millers and splitters to devastate the remaining forests, robbing them and their children of their supply of timber and firewood, and risking some of the climatic changes which are traceable to the destruction of forests? Are they prepared to sacrifice a source of large and increasing revenue to the demands of a limited class? It seems to me that sensible men can give only one answer, and that the country, when it learns the exact state of affairs, will authorise the Government to settle the question once and for all on a proper basis."

Here, then, is a heavy indictment. I have no reason to assume that Mr. Vincent has overdrawn his picture; but even if only half of what he says were to represent the actual state of affairs, the Victorians would have good cause to bestir themselves. There seems to be no doubt that, in spite of several forest laws passed since 1875, matters had not improved in 1887; the laws seem to have remained practically dead letters, whilst the destruction of the forests went on as merrily as before. In permitting this, the Colony of Victoria is not only destroying the timber supply of the future in favour of a limited number of present inhabitants, who make personal profit out of them, but it squanders also a source of revenue which, under proper treatment, would have increased, and ultimately formed an important item in the annual budget. The annual imports have already risen to a sum of about one million pounds, which has been chiefly expended on light woods, in which the Colony is at present deficient. But what will the imports amount to when the hard woods hitherto derived from the natural forests have come to an end? And how are mining operations then to be carried on? These questions should not be lightly treated.

I have endeavoured to ascertain what has been done since 1887, but I have not succeeded in this. The Agent-General for Victoria, whom I addressed on the subject, has informed me "that upon searching the records of his office it is found that they do not contain any papers relating to forest law and administration in the Colony, nor does it appear that any new laws on the subject have been passed within the last year or two." Nor have I been more fortunate in the Colonial Office or the Royal Colonial Institute, whose librarians have searched their records in vain *

From other quarters I hear that the Government of Victoria has now decided to proceed on the lines hitherto followed in South Australia, namely, to plant certain areas, and, I presume, to let the saw millers and splitters complete the work of destruction in the natural forests. Planting a few acres a year is all very well, but it will never make up for the destruction of the natural forests. In order to replace the latter, Victoria would have to plant at least 100,000 acres every year, and this it is not likely to do.

* The only enactment discovered was an Act relating to Crown lands permanently reserved from sale and vested in trustees, 1889, which provides for the issue of regulations by such trustees, arranging for the care, protection, and management of the lands vested in them, and the collection of tolls, entrance fees, or other charges for entering upon such lands. This Act might be construed to apply to forest estates.

If I may venture to offer the Colony of Victoria any advice, I should suggest their coming, without delay, to a definite conclusion whether they desire to save their natural forests or not. If the latter, there is nothing more to be said ; if the former, the first thing to be done is to secure the services of a fully competent forest expert, a man like those who introduced systematic forestry into India. The Victorian Government could, I have no doubt, obtain such a man from India, whose services might, in the first instance, be secured for a limited period, say five years. The forest expert, if secured, should then be directed to go round the Colony, see for himself, and then propose what in his opinion ought to be done. If necessary, the present forest law might be amended, but this should be postponed until the Government has had the benefit of the advice of a real forest expert. After all, the passing of fine laws is not such a difficult thing. What is of much greater importance is a determination to carry the law into effect when once passed. I believe that even with the present law a great amount of good could be done if the Government of Victoria were determined to apply it in a sound, sensible manner.

Under any circumstances, the Government of Victoria should not fall a victim of the delusion that the formation of some limited plantation will make up for the loss of the natural forests. The all-important step to be taken is to gazette and *demarcate on the ground* a sufficient area of reserved State forests, and to provide for their systematic management according to the approved rules of scientific forestry, and, in addition, to take what measures are desirable and practicable for the protection of the forest growth on the Crown lands which are not included in the reserved State forests. I am not in a position to say what the ultimate area of the latter should be ; that can only be decided after inquiry on the spot.

The following short abstract indicates what seems to be required at present :—

(1). Engagement of a thoroughly competent forest expert to be the head of the Victorian Forest Department.

(2). Selection, demarcation, and legal formation of a sufficient area of reserved State forests, suitably distributed over the country, systematically managed, and efficiently protected.

(3). Protection and disposal of forest produce on Crown lands not included in the reserved State forests.

If the Victorian Government makes up its mind to do this, all the details will settle themselves easily enough. And I have no doubt in my own mind that a similar policy is called for in all the other Australian Colonies.

As the following Table shows, the greater part of the area is still at the disposal of the several Governments :—

Colony.	Lands alienated permanently and conditionally, In square miles.	In per cent. of total area.	Land not alienated, in square miles.
New South Wales, ...	65,236	21	245,862
Victoria, ...	34,733	40	53,151
Queensland, ...	17,074	2·6	651,423
South Australia, ...	14,299	1·6	889,391
Western Australia, ...	3,548	·3	1,056,462
Total, ...	134,890	4·5	2,896,279
Tasmania, ...	7,207	27	19,008
New Zealand, ...	30,948	30	73,510
Grand Total, ...	173,045	5	2,988,797

Only 5 per cent. of the land has yet been alienated, leaving 95 per cent. as the property of the Government. Even in Victoria 60 per cent. of the area is still available for the selection of reserved State forests, and I have no doubt that a sufficient area could be so set aside without any real difficulty.

I do not, however, overlook that the several Governments have to contend with difficulties. The Australians are, no doubt, of an independent disposition and gifted with great energy. The reservation of land for forest purposes frequently runs counter to the wishes and interests of individuals, but the Government should not shrink from doing its duty to the general community. After all, experience has shown repeatedly that a little determination judiciously applied soon overcomes such opposition, and that the good common sense of the community, as a whole, soon recognises and appreciates a sound policy on the part of the Government. If there were any scarcity of land, I could understand insurmountable difficulties presenting themselves : and in that case the Australians might say that it would pay them better to use their land for other purposes, and to pay for the necessary timber and other produce. But such is not the case ; there is ample land for all requirements. Probably only one-third of the total area is at present put to profitable use. The good old proverb, "Where there is a will there is a way," holds, no doubt, good in Australia as elsewhere. Let us hope that the determination for judicious action may be forthcoming before the remaining natural forests have been altogether destroyed.

In bringing this paper to a conclusion, I desire to express my regret that it is not more complete. I started with the idea of giving a *résumé* of Forestry in all the Colonies, but this, as already explained, I had to abandon, at any rate for the present. If desired to do so, and my regular work permits, I shall gladly deal on a future occasion with some of the other large Colonies, such as Canada and the Cape.

In the meantime, I hope that I have succeeded in showing, on the one hand, what may be achieved by a fixed determination to grapple honestly with the forest business of a country, and, on the other hand, how delusive half-hearted measures are, especially when applied to a business which cannot be successful without long continued action on fixed lines.

India-rubber Industry of Upper Burma.—The trade in this commodity was first brought to the notice of the Local Government so far back as 1870, and its export to the Lower Provinces did not commence till 1873, when the monopoly was leased under the Burmese King to Chinese firms, who superintended the work. The sale then averaged from Rs. 90,000 to 1,00,000, but under the present *régime* the annual outturn is improving and the industry is becoming more important. The forests producing india-rubber occupy an extensive Kachin district north of Mogoung, and stretching east across the Chinese border, and the importance of this industry was first reported by Mr. Warry, of the British Consular service in China. The Kachins were at first extremely jealous of interference with their trees, and although they at first made a mistake of over-puncturing them, they are more careful now. Trees may, even at the present time, be seen punctured to the tenderest branches, but they do not appear to be drained to the extent of half their yielding power. Mogoung is the central town of the industry; four-fifths of the annual supply is brought in there by the Kachins in the employ of the Chinese lessees; the remaining is purchased by the agents on the spot. The practice is for the lessees to make liberal advances to the Kachins to meet their expenses during the collecting season; and when the produce is brought in, the refund is made by selling the rubber to the manager at half the market value. The Kachins, as a rule, are not very honest in their dealings, as they generally place stones inside the rubber balls to obtain a better weight; but better inducements offering lately they are bringing in purer rubber to the market. It has also been found that the travelling agents of the

lessees are very dishonest in cheating the producers by decreasing the weight as much as 60 per cent., and as the Kachins have no standard weight, these agents benefit considerably. Before the British occupation transit of rubber was subject to a tax by the chieftains of the different States through which the commodity passed, generally 10 per cent. (*i.e.*, ten balls were given for every 100 conveyed), but now things have changed, and an *ad valorem* rate of 10 per cent. on the value is charged. The Kachins are very particular as to the rights of extracting the rubber from their forests; and, as an instance of this, some 200 Chinese labourers were brought in by the lessees two years back, with the result that the Kachins started burning the forests and driving out the intruders. The trade is now yearly flourishing, and the revenue derived is increasing; the produce of the past year was 2,834 bags more than the previous one.—*Indian Engineering.*

RUBBER PAVEMENTS.—Ordinary caoutchouc seems very capable of being applied to an extraordinary variety of purposes. A glance at the patent records would surprise one at the many useful parts this valuable gum plays. In various Continental towns, we learn, rubber street-pavement is being introduced with a great deal of success. It appears, however, that this application of rubber is not a novelty in this country, for we are told that Messrs. Charles Macintosh & Co., the original patentees of vulcanised india-rubber, supplied the Midland Railway Company 13 years ago with large slabs of rubber, which were laid down on the roadway underneath the hotel at St. Pancras on the arrival side of the station to prevent the objectionable noise and tremor caused by the constant heavy vehicular traffic. This pavement has answered so admirably that other slabs were laid down in another roadway at the same station, and in 1881, we understand, this example was followed by the London and North-Western Railway Company. This rubber pavement has been found to be of great durability, and whilst it retains its elasticity it is neither affected by heat nor cold. The kind of pavement, being supplied in slabs, can readily be removed or replaced if necessary. More enterprise is now being shown on the Continent for the adoption of this class of rubber pavement than in this country. This is probably due to the fact that its advantages are very imperfectly known.—*Mechanical World.*

FOREST FIRES AND FOREST CONSERVANCY.—We extract the following correspondence from the *Times of India*:—"Quid Pro

Quo" airs the well-worn arguments against forest conservation, but is completely annihilated by "Forester."

"Forester's" letter, published by you more than a week ago, puts the case from his point of view clearly and forcibly. I have been since looking with interest, but in vain, for the appearance of any useful comments on it from the other side. That the existing system of forest conservation is far too lax to be effective is a truth which few will be inclined to dispute. But I venture to think that, together with stricter conservation, "Forester" might well have advocated a smaller area to be conserved. It is commonly thought that the Forest Department in this Presidency has a much larger area of land under its control than it can properly manage even though the strength of its establishment be doubled. Now if it were only content to confine its operations more exclusively to the greater hill ranges and their slopes, and to surrender the numberless isolated patches of ground at present scattered over the face of the country, few Revenue officers would be likely to find fault with the general tenor of "Forester's" proposals. But when the Collector sees nearly every available acre of waste in his district converted *nominally* into forest, he can hardly fail to perceive that a rigorous closure of the entire tract against man and beast would be alike impolitic, harsh, and impracticable. It is doubtful whether, save in certain and special circumstances, any land which is in genuine demand for purposes of *legitimate* cultivation ought to be included in forest at all. Probably many thousands of acres in the plains now under so-called forest might be given up to cultivation, with no other injury to true forest interests than loss of revenue from the grass. Often, indeed, the financial importance of this item seems to be their sole *raison d'être*. As for 'protected forests' they might perhaps with advantage be knocked on the head altogether, selected portions of them being constituted 'reserves' and the remainder being disforested. The clauses in the Forest Act relating to them were apparently never intended for application to this Presidency, and may be considered as on the whole unsuited to its physical conditions. —QUID PRO QUO.

To the above, "Forester" thus replies—

I am greatly obliged to "Quid Pro Quo" for his criticism, and still more so for his signature, which shows that even up to the present time the Forest Department is regarded, in some quarters, not as a benefit to the State, but as a nuisance to the Collector, an interloper who wants a favour, and might get it *for a consideration*. I freely admit that afforestment hampers the Collectors, and thank-

fully acknowledge the generosity with which most of them have subdued their natural dislike; but there are still a few unenlightened Philistines among them and their assistants.

I will now take the arguments *seriatim*. The first assertion, that conservancy is far too lax, I cordially agree with, and confine myself to pointing out that the laxity is due solely and exclusively to the action of Government as desired by its Revenue officers. I controvert absolutely and decisively the opinion that "it is commonly thought that the Forest Department has a much larger area of land under its control than it can properly manage, even though the strength of its establishment be doubled," both as to the alleged fact itself, and as to the generality of its acceptance. It is with diffidence that I ask "Quid Pro Quo" to allow that I, being brought up to the work, should know rather better than himself what is or is not in the power of a given organisation. What we can do, or cannot do, with the lands now in our charge rests entirely with the Revenue officers. We can do more than they will let us, even if the forests are or were reduced to a 100-acre patch. The whole forest establishment might be picketed round such a patch, and yet, under present conditions, the first man who liked might fire it and defy detection. The present situation is as though one should keep a store, and should say unto his shopmen, "Behold, here be goods a many and much precious gear, and they are under your hands. See unto it that ye guard them faithfully, for verily a strict account will I require of ye. Likewise beware ye hinder no man's pleasure. Here may all men come to take the air and other things, and there be some men may take some things and others other things, and yet others who are forbidden to lay hand on anything. And if ye do see any man taking that which he should not, ye shall say unto him that he doeth wrongly, but ye shall not hale him before the beak, lest the upright judge do smite you upon your digital articulations, saying why trouble ye the man (and me), he hath done well, it is a 'trivial offence.'"

Now for the next argument, "If it (the Forest Department) were only content to confine its operations more exclusively to the greater hill ranges and their slopes, and to surrender the numberless isolated patches of ground at present scattered over the face of the country, few Revenue officers would be likely to find fault with the general tenor of "Forester's" proposals. Excuse me, I believe the Revenue officers would reply as one man that the disforestment of the numberless patches in one place gave no relief to the villages, adjoining the "greater hill ranges" in another, and that, therefore, with regard to the remaining forest the *status*

quo must be maintained. As to these "numberless isolated patches," are there not numberless isolated patches of crop sprinkled over, and a curse to, our forests? I am going to stick like a leech to the one set till I get the other in exchange, tit for tat, "Quid Pro Quo." There is another small consideration with regard to the "numberless patches," *viz.*, that many are uncultivable or cultivable about once in seven years. What about the other six? Is it better for the State to receive nominal assessment, or to preserve the grass for a large sum yearly. "Impolitic, harsh, and impracticable" has the advantage of thoroughness in a much greater degree than the proposal it denounces, which was not "a rigorous closure of the entire tract," but of only so much as the people should burn. It was to be distinctly a punishment for incendiarism. At present there is no corporate punishment for incendiarism. The Anti-Forest Commission enquired of all men whether, in case of continuous and obstinate abuse of privileges, some of those privileges might not be withdrawn? Naturally the answer, by a large majority, was No! If the F. D. could catch the offender and prove the offence so that a native magistrate could not, without endangering his position, acquit the man, it might do so. If not, all the better. This answer, though honourable to politicians, is nothing less than a disgrace to civilization. It is a maxim of law that every privilege entails corresponding obligations, and in the Forest Act it is expressly laid down that all persons who enjoy a privilege in forest shall, to the best of their ability, aid in protecting such a forest. These people may turn out with more or less alacrity at the bidding of the guard and extinguish the fire; but can "Quid Pro Quo" search his conscience and say they are not confirmed incendiaries at heart? If I could obtain legal proof in every case, I should want no extraneous resistance; but since the privileges given by Revenue officers have paralysed protection, I expect the latter to act up to the above principle, and make those who profit take their share of responsibility. "The fathers have eaten limes and the children's teeth are set on edge," which is unfair.

The next argument that "It is doubtful whether * * * * any land which is in genuine demand for purposes of *legitimate* cultivation ought to be included in forest at all," I hardly know how to deal with. It operates on my mind much as a shrieking hinge or a screechy slate pencil does on the human nerves. Please, "Quid Pro Quo," do you not see that before long every inch of this terrestrial globe will be required for legitimate cultivation? There will be no doubt of the genuineness of the demand either, though

there may be some concerning the agricultural capabilities of bare rock. It is open to you, as a last retreat, to maintain defiantly that man never had any more than mere fancy requirements in wood, and will have none at all in future. But surely the desperate example of Central Asia ought not to be needed to show you that to every country a certain proportion of forest is as necessary as ditto of water (which, indeed, it largely controls). This proportion the most accredited modern foresters placed at 1-4th to 1-7th or thereabouts. Of course it is not a fixed quantity. I believe in Tanna, Khandeish, and Kanara the nominal forest area about reaches this quantity (I have no figures handy); but if "Quid Pro Quo" will come up to the Deccan, or to Ahmedabad, he will find a very different state of things. It might interest him, and would certainly be for his good, to get out the figures for the whole of "this Presidency," and see what proportion the forest bears to the total. Even then there will be deductions to be made.

The opinions expressed about "protected" forests I partly endorse, but do not admit that the provisions of the Act are either "unsuitable" or "not intended" for this Presidency. I consider the Act an excellent one, needing but little improvement. The "unsuitable" and "not intended" in my opinion lies in the way forests have been maltreated and abused. There are no "reserved" forests to speak of in the Presidency—certainly none in Tanna. It may please the Bombay Government to call them "reserved," but they are neither more nor less than "protected," according to the tone of the Act. Our so-called "protected" forests are simply public commons. In fact, most commons are more strictly kept than our "protected forests." As a final consideration, there will inevitably arrive—and it will not be very long either—a moment when there will be a man more than the cultivated area can produce food for. He will either die of starvation, or else step into his neighbour's shoes and get hanged, which would be better, as leaving one vacancy instead of none—that is, in other words, mankind will have to ultimately find means to check its own unlimited increase, which is the curse on its civilization. That being so, is it better that the time to apply the check should arrive while there is yet some comfort in living, a sufficiency of corn, of wood, of water, &c., &c.? Shall we claim a voice in the making of our destiny, or shall we grovel at the feet of Fate till she crushes us, like worms, singly by starvation, wholesale by disease? Suppose we apply the check while we have still the necessary one-fourth forest. All are comfortable. Suppose we criminally submit to clamour and reduce it to 1-40th. The people on the disforested area have be-

come densely packed as the rest. They have swallowed the sop, and are more hungry and clamorous than ever. Can we resist the increased pressure on the diminished area? Is it likely we could ever increase the area once abandoned? Should we have the nerve to try? Let us then do our duty *now* for our children's children's sake.—FORESTER.

THE NITRIFICATION OF SOILS.—It is not more than ten years ago that the process of artificial nitrification was discovered, although industrial chemistry has been occupied with the subject since the time of Lavoisier, that is about a century ago. At the present moment we know that the nitrification of soils is due to the presence of a living agent, whose evolutions are akin to those in the processes of fermentation, hydrophobia, the *charbon* disease, &c. The soil is a great workshop; there the food of plants is elaborated, to produce in turn man's alimentation, and is the work of a cellule, not more than the thousandth of a thousandth part of an inch in size. And it is that next-to-imperceptible organism, which sets in motion the machinery of vegetation whose output is our daily bread. It may be said that science has now within its grasp the secret of the fertility of soils and of plant nutrition. The discoveries of Messrs. Pasteur, Schlœsing, Muntz, and Winogradsky leave no doubt about the matter. Their experiments read as interesting as a novel, and he who runs can read. Ten years ago Messrs. Schlœsing and Muntz were studying in their laboratory the passage of some Paris sewage through a layer of soil, in order to prepare their evidence respecting the utilization of the city sewage on tracts of land contiguous to the forest of St. Germain. The chemists were astonished to observe that the ammonia and organic nitrogen in the sewage which filtrated through a mixture of sand and lime required such a long time—twenty days—to nitrify, but that after this period the nitrification was accomplished rapidly. Nay, more; the liquid that penetrated through the soil contained no longer ammonia or organic nitrogen. All the nitrogen of these two substances had been changed into a nitrate. If in this experiment the organic matters and the ammonia had been consumed by the oxygen of the air directly acting upon it, how could they explain the length of time required for the combustion. The supposition that an organised ferment was necessary to aid in the nitrification suggested itself to M. Schlœsing, and if so, these organisms could only act after sowing—that is, multiplying themselves and developing their germs. This supposition was justified by the experiments of

Messrs. Winogradsky and Muntz. The nitrification of the soil is not a purely chemical, but a biological act. However, it was Pasteur who first tore off the veil from Nature's face by showing the part which animalcules, or microbes, or bacteria play in the transformation of matter,—as vinification, the production of alcohol, of vinegar, putrefaction, &c., which, till then, were regarded as simply chemical re-actions. Of all the phenomena that take place in the soil, the most important, in point of fertility, is that connected with the slow combustion of organic matters designated by the term "nitrification." The latter resumes a succession of natural actions having for final results the transformation into carbonic acid, water, and nitric acid of their elements—carbon, hydrogen, nitrogen, &c.—under the influence of life, to produce those substances which build up animal and vegetable existences.

The fertility of soils and the production of man's food are thus intimately united with the phenomena of combustion, the latter's characteristic result being the production of nitrates. If vegetation, save in the cases of leguminous plants, could not receive its assimilable quantity of nitrogen from the soil by means of nitrates, it would perish. Part of the latter are washed out of the soil by rain and escape in time into rivers and reach the seas. Boussingault calculated that the Seine carries daily to the sea 238 tons of nitrates, the Rhine 193, and the Nile 301, being a total of 732 tons per day, equal to 267,000 tons annually, or more than three times the yearly quantity of Chili nitrates that France imports. Messrs. Schlœsing and Muntz, as already stated, found that the formation of nitrates in the soil was due to microbes. By placing organic or nitrifiable matters in an atmosphere of chloroform they could at pleasure stop the process of nitrification. Now the smallest portion of arable soil contains this agent or microbe-leaven. To place the discovery beyond a doubt, it was necessary to isolate the microbe, and when artificially obtained test its nitrifying power. This baffled scientists, till M. Winogradsky of Zurich bred the microbe not from the green matter, or chlorophyll of plants, but from carbonic acid or mineral carbonate. This nitro-microbe, or tiny living cell, differed from its fellows in decomposing the carbon of inorganic (as carbonate of lime, not of organic, as sugar, starch, &c.) substances. And note this great difference, whereas other microbes feed on the chlorophyll of the leaves, that is, on their carbonic acid, retaining the carbon and giving off the oxygen to the air, the nitro-microbe takes from the carbonic acid of the soil its oxygen, and fixing it upon the nitrogen gives birth to nitric acid. M. Winogradsky obtained the pure microbe by breeding it in solutions destitute of organic

matters, but containing carbonates of lime and magnesia. The microbes increased and multiplied and induced nitrification in artificial soils similar to what took place with Messrs. Schlœsing and Muntz when experimenting on the Seine sewage. And the quantity of nitric acid the microbes formed corresponded exactly to the quantity of carbonic acid they had borrowed for the sake of its oxygen from the carbonates of lime and magnesia. The great importance of M. Muntz's experiments can now be understood. A soil to be fertile must not only contain carbonate of lime, or of magnesia, &c., but a sufficient quantity of it. In the decomposition of plants many acids are produced ; these must be neutralised by carbonates, or nitrification cannot take place by microbes. Hence the plant must obtain its supply of nitrogen in another form. In forest, bog, and heather lands, where the soil is rich in humus acids, no nitrates will be found because the carbonates exist in too feeble proportions to neutralise the organic acids. In the case of clay soils, which are generally poor in lime, an application of the latter will supply not only what is deficient, but by reducing the tenacity of the clay permit the entrance of air or oxygen to circulate round the decaying vegetable matters. M. Muntz took specimens of peat and heather soils, hence acid. He applied to both a manure composed of horn shavings ; two other parcels of like soil he manured with dried blood ; and he kept portions of the same soil in their natural state as tell-tales. At the end of eight months M. Muntz estimated the quantities of ammonia and nitric acid formed. None of the latter was formed at all ; instead there was in both cases ammonia. The conclusion he arrived at was that forest and peat soils, &c., obtained their nitrogen from organic matter transforming it into ammonia, and that the latter can replace nitric acid. Nearly identical results were obtained when a strong clay was similarly manured. Samples of soil from a field in good tilth and from a garden were next experimented upon during 65 days, and with the same manures. The field soil produced nitric acid and but very little ammonia, while the garden soil yielded a fair percentage of ammonia, but also much nitric acid. The soils were now subjected to a temperature of 194 degrees Fahrenheit, to kill the microbes ; horn and blood manures were applied to this sterilised soil, when the latter produced only ammonia, like the peat and forest soils aforesaid. M. Muntz has discovered that they are microbes of an inferior kind which produce the ammonia, as he was able to isolate them and transform nitrogenised substances into ammonia. While a temperature of 194 degrees killed the nitro-microbes, it required 280 degrees to destroy the ammonia-microbes in the soil. The latter

were replaced when some of the unburnt was added to the burnt soil. M. Muntz is of opinion that the inferior develops the superior microbe, that is, ammonia precedes the formation of nitrates.—*Madras Mail.*

FLUMES.—Writing in the *North-Western Lumberman*, Mr. C. E. Potter states that in North-East California some very long flumes have been constructed for conveying timber from the site of its growth to the saw-mills. One of these is 40 miles long, and the timber costs but 2 dols. per 1,000 feet for transport over this distance as compared with 9 dols., the cost of transporting it by teams. These flumes are nearly all constructed on the same plan and are known as V flumes, being made of two 20-inch boards, which are battened on the outside at every joint, and a piece is laid across the bottom of the flume inside and about 4 inches from the bottom of the V to prevent the boards getting stuck on the bottom. The flume is 5 feet across at the top, and its height depends on the country traversed. The flumes sometimes run for long distances at angles of 30° to 40°; and in order to check the fall of the timber these rapid slopes are followed by long stretches of level, in which the water resumes its normal velocity. A first class flume costs 5,000 dols. a mile, and will carry without being pushed 100,000 feet of timber and 50 cords of wood per day.—*Indian Engineering.*

THE DISTRICT FOREST OFFICER TO HIS BABE. A SYLVAN ODE.

In this little babe you see
Forestry's epitome.
A nursery's his Reservation
Without need of proclamation.
Save on permit, none may enter
That so jealous-guarded centre:
At the door, to warn of danger,
Sit matey-guard and peon-Ranger,
While the ayah—Sub-Assistant—
From his wick's never distant.
Mummie is the D. F. O.,
Always playing Peep-and-Bo;
Then the lucky little laddie
For Conservator has daddie;

While (only born in last September!)
He himself's the Forest Member.
In this system bureaucratic
Nothing's doubtful or erratic;
No decree allows appealing—
Obey, or have an hour of squealing.
He mocks at all the dreary sermons
Preached by scientific Germans.
Coppice, Reboisement, and such twaddle
Baby's brains shall never addle;
No Working Plans need we be laying,
Baby's plans are all for playing;
Art can only nature fetter,
Natural Reproduction's better;
And it's clear to any gaby
Natural Reproduction's—Baby!

BEE-KEEPING IN INDIA.—It may be remembered that the late Mr. J. C. Douglas, of the Indian Telegraph Department, who, before his death, published an excellent Handbook of Bee-keeping, suggested to the Government of India the advantage that was likely to result from the general introduction of the industry into the agricultural tracts of the country. In his opinion, the climate was favourable to the success of bee-keeping, and the plants most extensively cultivated, notably mustard, yield such an abundance of honey as would find ample employment even for the little insect which is held up as the pattern of diligence and industry. Apart from local demands, which are likely to grow proportionately with the supply of honey, wax may, we think, in time form a valuable article of export to countries where wax lights are still indispensable, especially in the illumination of churches. The uses of wax are, however, so numerous for purposes of art that it is difficult to conceive how any supply of it can ever exceed the demand. The fact is, as Mr. Douglas's enquiries led him to believe, that the honey and wax which are brought into the Indian markets are the products of the wild bees alone, and it is safe to infer that the quality and quantity of both can be materially improved, not by scientific methods beyond the intelligence of the people, but by simple processes and appliances within their means, in the practical prosecution of apiculture. In some parts of India, Coorg, for instance, the Nilgiris, and the Wynaad in the Madras Presidency, in the Himalayas and Sub-Himalayan tracts, in the Khasia and

Jaintya Hills in the Assam Province, and in the Darjeeling Hills in the Bengal Presidency, bees are domesticated with a view to the production of a better quality of wax and honey. The general prices for both articles fluctuate very considerably. Honey sells from Rs. 3 to Rs. 8 per maund, while wax realises from Rs. 10 to Rs. 40 per maund. The local authorities in many parts of the country have expressed a decided opinion that apiculture may be followed successfully and with remunerative returns as a subsidiary industry by almost all classes of the population.

In those parts of the country where bee-keeping is practised (take, for example, the province of Coorg), the people in April or May smear the concave side of an earthen pot with honey-wax, make holes in it, take it to the jungles, and place it upside down on a piece of wood. Bees are attracted by the smell of the wax to the pot, which they enter by the holes. After from four to six days, when the bees are found to have taken to the pot, the pot is on a dark night covered over with a blanket or some thick cloth, and removed from its first position and placed either on a tree near the house or under its eaves or in some suitable locality close by. The bees give no trouble and cost no money either for their feeding or up-keep. Going out by day, they return in the evening to their pots with the stores of honey they have gathered from the flowers in the nearest jungles or fields under crop. Between the 15th April and the 15th June of each year they store up their honey, which is from the latter date to the end of July removed, a small quantity being left for the bees to feed upon. The comb, after the honey has been extracted from it, is put into a basket, which is placed over the mouth of a vessel of hot water, and under the action of the heat yields a liquid substance which, when the water has cooled down, is converted into the pure wax of commerce. A second harvest of honey and wax can be gathered in November from the same hives. Moorcroft in his travels in Cashmere describes another mode of domesticating the bee, which was once very widely practised, but which has now more or less gone out of vogue, in the Happy Valley. In every house as it was being built spaces were left empty in the walls about 14 inches in diameter and 2 feet, the average thickness of the walls, in length. This hollow space was carefully lined with a mixture of mortar, clay, and chopped straw, and closed at the inner end with a flat tile. When the season for gathering the crop of honey and wax came round, the flat tile at the inner end of the hive was withdrawn, some smoke was blown into it, when the bees either left or were stupefied and the comb was secured. When the flat tile was replaced

in its former position, the bees, after recovering from their stupefaction, returned to their hive, where, it is said, they followed their industry year after year and generation after generation. The people of the Khasia and Jaintya Hills, where they do not use a hollow piece of wood 2½ feet in length and 10 to 12 inches in diameter, which would appear to be their primitive form of artificial hives, employ a small box, about 18 inches square and of the same depth, which they put up under the eaves of their houses. The disadvantage of this plan is that they have to force open the back of the box, whenever they want to remove the honey. The bees are not killed or stupefied by the use of smoke, but they are simply removed from the comb, as it is broken or cut away from the box. To guard against their stings, the Khasias cover their faces with a thin cloth, usually their turbans, and chew a little ginger, the aroma of which is apparently so disagreeable to the bees as to keep them away while their stores are being plundered. In other parts of the country lubrication of the body with mustard oil, impregnated with the juice of the garlic, is said to be an efficient protection from stings. The application of the juice of the leaves of the black *Toolsee* plant (the *Holy Basil* or *Ocimum sanctum*) to the face, hands, and bust has, we believe, been found still more effective in many parts of Bengal. The leaf of the *pan* or betel affords almost immediate relief to the pain caused by the sting of the bee. A better form of hive, adopted from a European model, would be a box about 13½ inches square by 6½ in depth. On the top it may have nine bars or reglets, running from front to back, each bar being ⅜ths of an inch wide and ¼ of an inch deep, and the whole number of bars resting on a rabbet in the front and back pieces of the box. A glass window at the back is provided, so that it can be opened for the periodical inspection of the working and condition of the bees. A crownboard is held on to the top of the box by hooks or screws. If, instead of building their comb straight along the bars, the bees happen to work on the cross, the work of extracting the comb becomes difficult. But if the bees build along the length of the bars, any one bar with its comb can be removed without disturbing the other swarms in the same hive. On this plan it is possible to see which comb contains most honey and to avoid touching the comb with the young brood of bees. Such a hive, when full, may hold from 25 to 30 lbs. of honey. Of course, it is impossible to indicate any one plan of bee-keeping, which shall be applicable to all parts of India. Local conditions and the means of the people will often go far to render a modification of the best plan necessary. With the abundance of bees and the still greater

abundance of honey-bearing flowers to be met with in all parts of India, it is quite possible that, under some systematic efforts, bee-keeping may, in no long time, become a valuable industry to the people of India. The initial trouble and outlay are almost nominal, and as bees feed free, the honey and the wax of their produce may be said to be obtainable only for the bare gathering. It would be a good thing for the country if the industry could be started among the peasantry of those districts where the products of the wild bee are already articles of local consumption or exportation to external markets.—*Indian Agriculturist.*

THE COBRA AND THE REPUTED JEWEL IN HIS HEAD.—The Hindoo mind is naturally inclined to the marvellous; and though Hindoo authors have for countless generations past been accustomed to draw the long bow, yet in the fact of natural history to be now recorded, they had some amount of truth on which they worked, though they could not even in this help embellishing what they knew for certain with what they did not know or what they only fancied. Throughout the whole of Hindoo literature runs the story that a *naga* or a cobra di capello, when it attains the age of a thousand years,

"Wears yet a precious jewel in his head,"

which, it is said, it vomits forth during dark nights on the grass in lovely spots, and by the help of the light diffused by the gem far and near to a radius of———(this distance varies, according to the strength of the imagination of the Hindoo poet or philosopher, who takes upon himself to reproduce the mixed fact and fable, from only a few yards to a good many miles), the cobra seeks its prey; and woe betide him who then approaches the spot, for, however far the cobra may have wandered away, it is sure to be back where the gem shines before the intruder can reach it, and to bury its fangs deep in his flesh. But nevertheless this mixed fact and fable loves to relate how, if by more than the cunning of the serpent, any mortal is fortunate enough to forestall the serpent and hide quickly the clear shining gem under a bushel, the outwitted cobra dashes itself on the spot where it happens to be—breaks its spine and dies.

Now let us hear what Professor H. Hensoldt has to say on the subject in *Harper's Magazine.*

"The cobras," he observes, "are perhaps the only serpents which will eat insects. They feed on ants, grasshoppers, a variety of beetles, &c., but seem to have a special preference for fire-flies,

perhaps because the latter can be caught at night much more easily than any other kind of insect. I have often for hours watched cobras in the grass catching the fire-flies, darting about here and there—a process which requires considerable exertion on the part of the serpent. Now every entomologist knows that the flying *Lampyridæ* consist entirely of males. The females, which are not very numerous, are much larger and cannot fly, as they have only rudimentary wings. They sit quietly in the grass emitting a greenish light, which is much stronger than that of the males, and fades and becomes brilliant at regular intervals. If a glow-worm be watched for a time, a steady current of male insects will be observed flying towards it, and alighting in close proximity. Now it so happens that a little pebble of chlorophane or fluorspar, emits in the dark a greenish light, which is so much like that of the female *Lampyris* that it is an easy matter to deceive the male fire-fly with it, by setting it up as a decoy. The cobras have gradually come to take advantage of an experience made by them, accidentally, I dare say, thousands of years ago. It may frequently happen, for instance, that a cobra finds one of these shining stones in the gravel of the dry river-beds (where they are by no means uncommon), being attracted to it by its glow at night, and taking it for a glow-worm. It would then, at any rate, notice that the fire-flies could be caught much more easily and quickly in the neighbourhood of that shining object than anywhere else, and would habitually return to it. Several cobras might thus come together, and there would be competition, and from this moment to the finding out that success in capturing fire-flies depends on the possession of this phosphorescent pebble, and to the seizing of it in order to prevent another snake from monopolizing it, is, in my opinion, no great step and involves no exceptional powers of reasoning. The cobra carries it about and soon learns to treasure it, for it affords it an easy means of getting its living. All it has to do is to deposit the stone in the grass at night, and the obliging insects literally fly down its throat. There are several reasons for believing that no individual experience is now necessary to cause any cobra to act in this manner, but that even a young cobra, on finding such a stone, will instinctively take it up, and use it in the manner I have described. For it must be borne in mind that there is an inherited race-memory among the lower animals which is often far stronger than the memory gathered during the short lifetime of the individual. What causes a blind kitten to spit and put up its back if a dog is brought near it? It never saw a dog, never saw anything, yet it knows there is some danger ahead. Thus the accumulated experi-

ence of the cobra's ancestors during countless generations now causes it to act in a manner which we refer to instinct.—*Indian Agriculturist.*

A NEW FOREST CLEARER.—An invention has been patented in New Zealand which, if it does all that is claimed for it, will make clearing of forest land a much more easy matter than it is now. It consists in a composition with which trees can be poisoned, mingling itself with the sap and circulating through every branch and leaf, utterly destroying the life and rendering the standing tree in three months' time dead and rotten, and so highly inflammable that when fired, it burns away literally root and branch, for the fire creeps even down the roots into the ground, consuming them so thoroughly that the land can be ploughed afterwards. It is available also for old stumps, thus doing in a month what nature takes years to accomplish. The process of inoculation is simply the boring of a hole about 6 inches into the tree with an inch auger, filling it with the composition, and afterwards plugging it with cork, touch-clay, or other suitable substance. The composition has had several trials and is stated to have done effectual work in all cases; in one instance 700 acres having been cleared with it, every tree, it is claimed, being successfully dealt with. It is also said to be very inexpensive.—*Indian Agriculturist.*

SERVIAN FORESTS.—One of the effects of Servian independence appears to be an almost total disafforestation of the country. The Vice-Consul at Nish says that during the Turkish occupation Servia was covered with magnificent forests of oak, beech, chestnut, and walnut trees, by means of which the country was assured of a regular and plentiful supply of water, and in the recesses of which the natives found shelter and refuge from their foreign conquerors. From the date of her independence a destruction of these invaluable treasures commenced, which has been carried on with remorseless and unreflecting perseverance, and it appears as though there were, at the present day, a race against time to complete the havoc. From time to time the consciences of Ministers and Governments have been roused to interfere, but beyond the passing of laws, which remain a dead letter, hardly anything has been done to arrest the evil. Neither do the authorities to whom the work of supervision has been confided appear to have attained to a proper apprehension of the importance of the duties devolving upon them;

it has even been remarked that such action as the highest authorities have taken has been rather prompted by considerations relative to the supply of acorns and beech-nuts for feeding swine than by a proper regard to the preservation and plantation of timber as a national need. Floods in winter and drought in summer were declared by Mr. Borchgrave, in 1883, to have already begun to exact the penalty which carelessness or want of forethought must be called upon to pay: but the peasant and his goats continue their work of destruction, whilst the authorities are apparently more solicitous of avoiding occasions of discontent which restrictive measure would create than of applying such remedies as legislation has placed in their hands. Whole mountains may be seen completely denuded of timber, with the exception of a low worthless scrub, which were a few years ago covered with woods, but which have lately fallen victims to the innumerable herds of goats which are allowed to browse at will. The peasants, amongst whom the land was divided at the time of the Servian independence, have cleared vast tracts for the purposes of agriculture, and possess the right of cutting timber for firewood in those forests which are under the management of the different communes. Very little coal is used for household purposes, and the amount of wood required for daily consumption adds enormously to the drain on the national resources. The best wooded parts of Servia at the present day are the districts of the south and south-east, but especially the department of Toplitza, which may be said to contain the only remaining virgin forests of Servia, and whence are annually drawn large supplies of walnut trunks and oak staves for casks. Walnut trees, which attain to an enormous growth, have been mercilessly dealt with, the value of this wood having attracted the attention of Austrian merchants, who send their agents to choose and cut the wood for exportation. The fir and juniper are found in the central and western valleys, and on the great Kopaonik range, on the south-east; the pine on the heights of Zlatibor. During 1888 5,000,000 kilogrammes of cask staves were exported to Austria-Hungary and France and 300,000 kilos of walnut trunks for gun-stocks and furniture to Austria, this large supply being obtained from Toplitza. About 8,000,000 kilos of planks, firewood, and other small timber circulated in the Nish district during the same period.—*Timber Trades Journal.*

CEYLON IN URGENT NEED OF A GAME LAW.—There seems to be no doubt, says a correspondent of a Ceylon paper, that game, once

so abundant, is now diminishing greatly owing to its wholesale destruction by the natives for purposes not of legitimate food, but of trade. The trade is in the hands of Moormen who supply the villagers with gunpowder and shot. The villagers shoot every head of game that comes in their way, usually at night over water-holes in the dry season. Any one whose duty it is to travel much, especially in remote parts of the island, will bear me out in saying that seldom a day passes without meeting one or more men with guns in their hands going out shooting, while men carrying huge loads of hides and horns constitute a regular service. There are also a great many so-called *savants*, usually foreigners, who come here to prosecute their studies and look to pay the expenses of their tours by carrying off quantities of skins of all sorts which they mostly purchase from natives. Last year the village of Mahakekirawa was literally carpeted with dry skins, which one of these persons had by timely notice beforehand induced the natives to shoot and bring in to be purchased by him at market price! When the supply was large, and the buyer a single individual, the market-rate may be easily conjectured—just what he chose to give them. A great many lives of elephants are recklessly destroyed by elephant catchers, who shoot the mothers in order to get at the calves, or who drive a herd for weeks before they kraal them. The poor beasts are then so exhausted, that in many cases not 10 per cent. survive. The killing of elephants in herds should be strictly forbidden and restricted to solitary rogues. Like the game, fish is disappearing, or has quite disappeared from many rivers owing to the destructive and pernicious habit of driving fish into kraals. As this goes on at all seasons, and as fish of all sizes are taken, the rivers are being drained of their resources.—*Indian Agriculturist.*

VII. Extracts from Official Gazettes.

1.—Gazette of India—

No. 744.—*The 5th September, 1890.*—With reference to the Notification of this Department No. 586-F., dated the 11th July last, *Mr. F. B. Dickinson*, Officiating 1st grade Deputy Conservator of Forests, Central Provinces, reverted to his substantive appointment of Deputy Conservator, 2nd grade, on the 13th ultimo.

No. 746.—*Mr. F. B. Dickinson*, Deputy Conservator of Forests, 2nd grade, Central Provinces, is appointed to officiate in the 1st grade of Deputy Conservators during the absence on privilege leave for two months and twenty-two days of *Mr. J. Nisbet*, Officiating 1st grade Deputy Conservator, Burma, with effect from the 30th August, 1890, and until further orders.

No. 1001-9.—*The 24th September, 1890.*—The services of *Mr. E. C. Cotes*, First Assistant to the Superintendent of the Indian Museum, are transferred to the Forest School at Dehra for two months, with effect from the 1st July, 1890.

No. 840.—*The 3rd October, 1890.*—With reference to the Notification of this Department No. 26-F.C., dated 30th December last, *Mr. F. B. Dickinson* continued to officiate as a Conservator of Forests of the 3rd grade, in charge of the Northern Circle in the Central Provinces, from 24th November to 6th December, 1889 (both dates inclusive), and reverted to his substantive appointment of Deputy Conservator, 2nd grade, on 7th December, 1889.

No. 850.—With reference to the Notification of this Department No. 88 F.C., dated the 21st February last, *Mr. W. G. Allan*, Deputy Conservator of Forests, 2nd grade, North-Western Provinces and Oudh, continued to officiate in the 1st grade of Deputy Conservators from 11th February to 3rd July, 1890 (both dates inclusive).

No. 852.—Consequent on the retirement from the service of *Mr. W. G. Allan*, Officiating 1st grade Deputy Conservator of Forests, North-Western Provinces and Oudh, *Mr. J. T. Jellicoe*, Deputy Conservator, 2nd grade, Assam, is appointed to officiate in the 1st grade of Deputy Conservators, with effect from the 4th July, 1890, and until further orders.

No. 927.—*The 31st October, 1890.*—With reference to the Notifications of this Department No. 16-F.C., dated 29th November, 1889, and No. 643-F., dated 31st July last, *Mr. W. H. Reynolds* resumed charge of the Office of Superintendent of Forest Surveys from *Mr. E. F. Litchfield*, Deputy Conservator of Forests, North-Western Provinces and Oudh, on the forenoon of the 24th instant.

No. 941.—*The 14th November, 1890.*—The following temporary arrangements are made during the absence, on two months' privi-

lege leave, of *Major C. T. Bingham*, R.C., Officiating Conservator of Forests, 3rd grade, Tenasserim Circle, Burma:—

(i). *Mr. M. H. Ferrars*, Deputy Conservator, 1st grade, Burma, held charge of the Tenasserim Circle, in addition to his own duties, from the 10th October to the 6th November, 1890 (both dates inclusive).

(ii). *Mr. P. J. Carter*, Officiating Conservator, 3rd grade, Pegu Circle, to hold charge of the Tenasserim Circle, in addition to his own duties, with effect from the 7th November, 1890, and until *Major Bingham* returns from leave.

No. 1574-52-19.—*The 17th December, 1890.*—The following transfers from the Forest to the Survey of India Department have been made, with effect from the 24th October, 1890:—

Mr. W. H. Reynolds, Deputy Conservator, 2nd grade, in the Punjab, and Superintendent of Forest Surveys, to rank as a Deputy Superintendent of the 4th grade, in the Survey of India Department.

Mr. E. F. Litchfield, Deputy Conservator, 4th grade, North-Western Provinces and Oudh, to rank as Assistant Superintendent of the 2nd grade, in the Survey of India Department.

No. 1041.—*The 19th December, 1890.*—Consequent on the retirement from the service of *Mr. W. R. J. Brereton*, Deputy Conservator of Forests, 1st grade, North-Western Provinces and Oudh, *Colonel J. E. Campbell*, R.S.C., Deputy Conservator, 2nd grade, North-Western Provinces and Oudh (on furlough), is promoted to the 1st grade of Deputy Conservators, with effect from the 18th November, 1890.

No. 1043.—With reference to the Notification of this Department, No. 881-F., dated the 17th October last, *Mr. T. H. Aplin*, Officiating 1st grade Deputy Conservator of Forests, Burma, reverted to his substantive appointment of Deputy Conservator, 2nd grade, on 24th November, 1890, the date of return from privilege leave of *Mr. J. Nisbet*, Officiating 1st grade Deputy Conservator, Burma.

No. 1045.—With reference to the Notification of this Department, No. 878-F., dated the 16th October last, *Mr. A. E. Wild*, Officiating Conservator of Forests, 3rd grade, Punjab, reverted to his substantive appointment of Deputy Conservator, 1st grade, on 11th December, 1890, the date of return from privilege leave of *Mr. R. H. C. Whittall*, Conservator, 3rd (Officiating 2nd) grade.

Mr. E. McA. Moir, Deputy Conservator, 2nd grade, North-Western Provinces and Oudh, officiated in the 1st grade of Deputy Conservators, *vice Mr. Wild*, from 11th October to 10th December, 1890, both dates inclusive.

No. 976.—*The 28th November, 1890.*—Consequent on the departure on furlough of *Mr. C. Bagshawe*, Conservator of Forests, North-Western Provinces and Oudh, and with reference to the Notification of the Madras Government, No. 412, dated the 16th September last, *Mr. J. Sykes-Gamble*, Conservator of Forests, Madras, is appointed Conservator of the School Circle in the North-Western Provinces and Oudh, and Director of the Imperial Forest School at Dehra Dún, with effect from 14th October, 1890. *Mr. Gamble* will rank as a Conservator of the 2nd grade (supernumerary).

2.—MADRAS GAZETTE—

The 2nd September, 1890.—In the Examination in Forest Law, Code, and Accounts held on the 16th August, 1890, in accordance with para. 56 of the Code—

K. Sama Row, Second Clerk, District Forest Office, Bellary, has passed; results fair.

A. Kistna Row, Forester, Kurnool, has passed; fair.

D. A. Chellappah, Forester, Cuddapah, has passed.

The 11th September, 1890.—The following transfers are ordered in the Northern Circle:—

Mr. H. J. McLaughlin, Forest Ranger, 2nd class, from Ganjam (now temporarily working in Kurnool) to Cuddapah; to join when relieved in Kurnool.

Mr. M. H. Tweedie, Forest Ranger, 3rd class, from Kurnool to Ganjam, to join on expiration of leave.

The 12th September, 1890.—Ranger, 3rd class, *C. M. Maduranayagam Pillai* (North Arcot), to be Sub-Assistant Conservator, 2nd class, acting sub. *pro tem.*, from the 1st September, 1890.

No. 412.—*The 18th September, 1890.*—The services of *Mr. J. S. Gamble*, M.A., F.L.S., Conservator of Forests, Northern Circle (now on special leave to Europe on urgent private affairs for six months from 6th April, 1890), are placed at the disposal of the Government of India, Revenue and Agricultural Department. To have effect from the date of his return from leave.

No. 417.—*The 19th September, 1890.*—*Mr. E. D. M. Hooper*, Deputy Conservator of Forests, 2nd grade, to be District Forest Officer, Bellary.

No. 418.—*Mr. P. M. Lushington*, Assistant Conservator of Forests, 2nd grade, to be District Forest Officer, Kurnool.

No. 419.—*Mr. T. P. Peake*, Assistant Conservator of Forests, 1st grade, to act as Deputy Conservator of Forests, 4th grade, during the absence of *Mr. G. Homfray* on leave, or until further orders.—To have effect from 3rd August, 1890.

The 22nd September, 1890.—*Mr. A. Strinivasa Chamberlain*, from Ranger, 5th class, to Forester, 1st class, sub. *pro tem.*

Mr. W. Carroll, Sub-Assistant Conservator, 1st class, to Trichinopoly and Tanjore for special duty.—To join on expiration of the three months' privilege leave granted in Gazette of 8th July, 1890, Part I., page 474.

T. Malaya Pillai, Ranger, 5th class, Tinnevelly District, to be Ranger, 3rd class, sub. *pro tem.*, *vice C. M. Maduranayagam Pillai*, promoted to the Sub-Assistant Conservators' class.

Forester, 1st class, *M. Subrayalu Naidu*, South Arcot District, to be Ranger, 5th class, sub. *pro tem.*, *vice Malaya Pillai*, promoted.

Forester, 1st class, *Arulanandam Pillai*, Tinnevelly District, to be Ranger, 5th class, sub. *pro tem.*, *vice Mr. Chamberlain*, reduced.

The last two promotions are subject to exemption by Government, and in the case of *Subrayalu Naidu*, to his qualifying in Surveying and Levelling when his services can be spared to go through the prescribed course.

The 23rd September, 1890.—Ranger *A. Durgiah Nayudu* is granted an

extension by one month, in continuation of the two months' leave notified at page 968, Part II. of the *Fort St. George Gazette*, dated 15th July, 1890.

The 7th October, 1890.—*Mr. C. P. Howell*, Sub-Assistant Conservator, Tinnevelly District, under Article 291 of the Civil Service Regulations, is granted privilege leave for two months from date of relief.

Mr. G. W. Thompson, Ranger, 5th class, Salem, is transferred to Tinnevelly District.

The two months' leave granted to Ranger *Mr. S. Solomon*, North Coimbatore Division, notified at page 1134, Part II. of the *Fort St. George Gazette*, dated 19th August, 1890, is extended by one month, *i.e.*, up to 10th November, 1890.

The 10th October, 1890.—During the absence on sick leave of *A. N. Hanumanta Row*, Forest Ranger in the Ganjam District, *P. R. Ruthnasamy Pillay*, Forester, 1st class, is appointed to act as Ranger, 5th class, and is transferred from Kurnool to Ganjam.—To join forthwith.

No. 449.—*The 14th October, 1890.*—*Mr. J S. Gamble*, M.A., F L.S., Conservator of Forests, Northern Circle, has been permitted by the Right Honorable the Secretary of State to return to duty within the period of his leave.

No. 452.—*The 17th October, 1890.*—*Mr. C. Somers-Smith*, Assistant Conservator of Forests, Madras, has been granted by the Right Honorable the Secretary of State for India an extension of two months' extraordinary leave on medical certificate without pay.

No. 467.—*The 28th October, 1890.*—*Mr. A. W. Lushington*, Deputy Conservator, 4th grade, and Acting Deputy Conservator of Forests, 3rd grade, to be District Forest Officer, Godavari.

No. 468.—*Mr. J. S. Battie*, Assistant Conservator of Forests, 1st grade, and Acting Deputy Conservator of Forests, 4th grade, to be District Forest Officer, Ganjam. - To join forthwith and relieve *Mr. Lushington*.

The 28th October, 1890.—*P. Surappa Aiyar*, from Forest Ranger, 5th class, to be Forester, 1st class, from 1st November, 1890.

The 17th November, 1890.—*Mr. R. W. Rouse*, Forester, 1st class, Madura District, to act as Ranger, 5th class, sub. *pro tem.*, from 1st November, in the same district.

The 20th November, 1890.—As the next Departmental Examination in Accounts, Code, Act, and Rules [clauses (*a*) and (*b*) of para. 56 of the Code] will be held on Monday, the 19th January, 1891, District Forest Officers are requested to send in names of candidates whom they consider to have a reasonable expectation of passing it, so as to reach this office not later than the 15th December, 1890.

No. 503.—*The 24th November, 1890.*—*Mr. F. D'A. Vincent*, Deputy Conservator of Forests, 2nd grade, Madras Presidency, has been permitted to resign his appointment, with effect from 13th September, 1890.

The 12th December, 1890.—Forest Ranger *M. Rama Row*, North Coimbatore Division, is granted privilege leave for two months, from 22nd November, 1890, under article 369 of the Civil Service Regulations.

T Narayanaswami Aiyar, Forest Ranger, 4th class, North Malabar, is granted privilege leave for one month, under Article 291 of the Civil Service Regulations, from 1st January, 1891, or date of relief.

M. Rama Rao, Forest Ranger, 5th class, North Coimbatore Division, is granted privilege leave for two months, under Article 369 of the Civil Service Regulations, from 22nd November, 1890.

Mr. Monisse, Forester, 3rd class, North Coimbatore Division, to act as Ranger, 5th class, during the absence of *M. Rama Rao* on leave, or until further orders.

The 13th December, 1890.—The following promotions are ordered in the subordinate staff of the Northern Circle :—

P. R. Ruthnasawmy Pillai, Ganjam, Forester, 1st class, to be Ranger, 5th class, on probation for 6 months from 1st August, 1890.

K. Rama Row, Bellary, Forester, 2nd class, and Acting Ranger, 5th class, to be Ranger, 5th class, permanent, from 1st August, 1890.

No. 550.—*The 19th December, 1890* —*Mr. Somers-Smith*, Assistant Conservator of Forests, Madras, has been granted by the Right Honorable the Secretary of State for India an extension of two months' extraordinary leave on medical certificate without pay.

3.—BOMBAY GAZETTE—

No. 6238.—*The 3rd September, 1890.*—*Mr. G. P. Millett*, Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer South Thána, is allowed privilege leave of absence for three months from the 6th September, 1890, or such subsequent date as he may avail himself of it.

No. 6423.—*The 10th September, 1890.*—*Mr. T. B Fry*, Deputy Conservator of Forests, 3rd grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

Messrs. G. D. Millett and *F. Gleadow*, Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, South Thána, on the 5th instant, after office hours, in addition to his own office of Divisional Forest Officer of North Thána.

The 12th September, 1890.—*Mr. R. S. Fagan*, Deputy Conservator of Forests and Divisional Forest Officer of West Khándesh, has been allowed privilege leave of absence for one month from the 31st August, 1890, by the Conservator of Forests, N C., under the authority of Government Resolution No. 2149, dated 20th March, 1889, Revenue Department, and *Mr. F. R. Desai*, has been desired to take over charge of his office in addition to his own.

Messrs. R. S. Fagan and *F. R. Desai*, Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office of West Khándesh on the 30th August, 1890, after office hours.

Mr. Desai is to hold charge of the West Khándesh Division in addition to his own charge of the East Khándesh Division.

No. 6481.—*Mr. R. P. Ryan*, Acting Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer, Bijápur, is allowed

an extension up to the 15th September, 1890, of the privilege leave of absence for one month granted to him in Government Notification No. 6041, dated 25th August, 1890.

No. 6585.—*The 15th September, 1890.—Mr. E. G. Oliver,* Assistant Conservator of Forests, 2nd grade, and Divisional Forest Officer, Working Plans Branch, No. II., Kánara, is allowed examination leave for one month under section 57 of the Forest Department Code, 3rd Edition.

No. 6595.—*The 18th September, 1890.—Colonel A. Pullan,* Superintendent, Bombay Forest Survey, is allowed privilege leave of absence for three months with effect from 12th September, 1890.

No. 6611.—*The 19th September, 1890.—Mr. F. R. D Bell,* Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer, Working Plans Branch, No. I., Kánara, is allowed privilege leave of absence for one month with effect from 15th September, 1890.

The 29th September, 1890.—Messrs. G. A. Hight, Deputy Conservator, and *R. P. Ryan,* Assistant Conservator of Forests, respectively delivered over and received charge of the Bijápur Forest Division on the afternoon of the 20th instant.

The 30th September, 1890.—Messrs. T. R. Bell, Acting Deputy Conservator of Forests, and *Haripad Mitra,* Sub-Assistant, respectively delivered over and received charge of the Divisional Forest Office Working Plans, Party No. I., Kánara, on the forenoon of the 25th instant.

The 1st October, 1890.—Messrs. A. C. Robinson and *J. Baptista,* L.C.E., Acting Sub-Assistant Conservators of Forests, respectively delivered over and received charge of the North Sub-division Forest Office, North Thána, on the 8th ultimo, before office hours. The latter officer is to hold charge in addition to his own office of the South Sub-division, North Thána

The 4th October, 1890.—Messrs. R. C Wroughton and *T. B. Fry,* Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Working Plans, on the 30th September last, before office hours.

No. 7046.—*The 6th October, 1890.—Mr. R. P. Ryan* Acting Assistant Conservator of Forests, 1st grade, and Divisional Forest Officer, Bijápur, has been allowed an extension up to the 20th September, 1890, of the privilege leave of absence granted to him in Government Notifications No. 6041, dated 25th August, 1890, and No 6481, dated 12th September, 1890.

The 7th October, 1890.—Messrs. F. R. Desai and *R. S. F. Fagan,* Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khándesh, on the 1st instant, before noon.

No. 7148.—*The 8th October, 1890.—Mr. B. J. Haselden,* Assistant Conservator of Forests, 3rd grade, and Divisional Forest Officer, Central Division of Kánara, is allowed privilege leave of absence for one month from 10th October, 1890, or from such subsequent date as he may avail himself of it.

Messrs. N. D. Satarawala, Sub-Assistant, and *E. G. Oliver,* Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Working Plans, Party No. II., Kánara, on the afternoon of the 11th instant.

No. 7334.—*The 15th October, 1890.*—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. Showkirám Pribdás, to be Sub-Assistant Conservator of Forests, 1st grade, *vice Mr. B. J. Haselden*, promoted.

Mr. W. G. Clabby, to be Sub-Assistant Conservator of Forests, 2nd grade, *vice Mr. Showkirám Pribdás.*

Mr. J. H. Clabby, to be Sub-Assistant Conservator of Forests, 3rd grade, *vice Mr. W. G. Clabby.*

Mr. W. A. Wallinger to be substantive *pro tem.* 2nd grade Sub-Assistant Conservator, *vice Mr. J. M. Fernandez* serving in the Kolhápur State.

Mr. Haripad Mitra, L.C.E., to be substantive *pro tem.* 2nd grade Sub-Assistant Conservator, *vice Mr. W. G. Clabby*, serving in the Rajpipla State.

Mr. J. Baptista, L.C.E., to be substantive *pro tem.* 3rd grade Sub-Assistant Conservator, *vice Mr. J. H. Clabby*, confirmed.

The 16th October, 1890.—*Messrs. J. Baptista* and *A. C. Robinson*, L.C.E., Acting Sub-Assistant Conservators of Forests, respectively delivered over and received charge of the North Sub-division Forest Office, North Thána, on the 8th instant, before office hours.

The 30th October, 1890.—*Mr. T. R. D. Bell*, Acting Deputy Conservator of Forests, resumed charge of the Divisional Forest Office, Working Plans, Party No. I., Kánara, from *Mr. Haripad Mitra*, Sub-Assistant, on the forenoon of the 25th instant.

Mr. B. J. Haselden, Assistant Conservator of Forests, delivered over charge of the Central Forest Division of Kánara to *Mr. W. R. Woodrow*, Deputy Conservator and Divisional Officer, Southern Division, Kánara, on the afternoon of the 18th instant.

No. 7835.—*The 4th November, 1890.*—*Mr. W. A. Talbot*, Acting 3rd grade Deputy Conservator of Forests and Divisional Forest Officer, North Division of Kánara, is allowed furlough for six months.

The 6th November, 1890.—*Messrs. Ganesh Sakharam Hingé*, Sub-Assistant Conservator of Forests, and *R. S. F. Fagan*, Deputy Conservator of Forests and Divisional Forest Officer of West Khándesh, respectively delivered over and received charge of the Sub-Division Forest Office, West Khándesh, on the 23rd ultimo, before noon.

The 8th November, 1890.—*Mr. E. G. Oliver*, Assistant Conservator of Forests, assumed charge of the Dálhi Settlement Office, Kolába, on the 3rd instant, before noon.

The 12th November, 1890.—*Messrs. W. A. Talbot* and *H. Murray* respectively delivered over and received charge of the office of the Divisional Forest Officer, Northern Division of Kánara, on the forenoon of the 10th instant.

The 14th November, 1890.—*Messrs. E. G. Oliver* and *T. R. D. Bell* respectively delivered over and received charge of the Divisional Forest Office on the afternoon of the 29th October, 1890.

The 20th November, 1890.—*Messrs. F. Gleadow* and *A. Stewart*, Deputy Conservators of Forests, respectively delivered over and received charge of the South Thána Divisional Forest Office on the 6th instant, before office hours.

The 24th November, 1890.—*Mr. B. J. Haselden*, Assistant Conser-

vator, resumed charge of the Central Forest Division of Kánara from *Mr. W. R. Woodrow*, Deputy Conservator of Forests, on the afternoon of the 18th instant.

The 3rd December, 1890.—*Messrs. R. S. F. Fagan*, Deputy Conservator of Forests, and *G. S. Hingé*, Sub-Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forest Office, West Khándesh, on the 22nd ultimo, in the afternoon.

No. 8633.—*The 5th December, 1890.*—His Excellency the Governor in Council is pleased to appoint *Mr. A. Stewart*, on being relieved by *Mr. G. P. Millett*, to do duty as Divisional Forest Officer, North Kánara, during the absence of *Mr. W. A. Talbot*, or pending further orders.

No. 8906.—*The 12th December, 1890.*—His Excellency the Governor in Council is pleased to appoint *Mr. B. G. Deshpánde* to act as Sub-Assistant Conservator of Forests and to do duty in the Southern Circle so long as the vacancy in the 3rd grade of Assistant Conservator may continue, or pending further orders.

4.—CALCUTTA GAZETTE—

No. 7357G.—*The 4th September, 1890.*—*Mr. F. S. Barker*, Assistant Conservator, 1st grade, and Officiating Deputy Conservator, 4th grade, to officiate in the 3rd grade of Deputy Conservators, *vice Mr. A. J. Mein*, on privilege leave, from the 1st July, 1889, to the 30th September, 1889.

No. 7358G.—*Mr. T. J. Campbell*, Assistant Conservator, 2nd grade, Officiating 1st grade, to officiate as Deputy Conservator, 4th grade, *vice Mr. F. S. Barker*, with effect from the 1st July, 1889, to the 30th September, 1889.

No. 7359G.—*Mr. H. J. Young*, Assistant Conservator, 2nd grade, officiating 1st grade, to officiate as Deputy Conservator, 4th grade, *vice Mr. D. P. Copeland*, Officiating Deputy Conservator, on privilege leave, with effect from the 1st July, 1889, to the 30th September, 1889.

The 10th October, 1890.—*Mr. A. L. Home*, Conservator of Forests, Bengal, is granted furlough for two years, with effect from the 18th October, 1890. He made over charge of the Forest Department on the afternoon of the 8th instant to *Mr. E. P. Dansey*, Officiating Conservator of Forests, Berar.

The 10th October, 1890.—*Mr. W. H. Lovegrove*, Assistant Conservator of Forests, is posted to the charge of the Kurseong Subdivision, Darjeeling Forest Division, on the expiry of the one month's examination leave granted to him in the Notification, dated the 6th September, 1890.

The 14th October, 1890.—In supersession of the Notification, dated 28th July, 1879, published at page 777 of the *Calcutta Gazette* of 30th idem, the Lieutenant-Governor is pleased to direct, under sections 2 and 75 (*a*) of Act VII. of 1878 (the Indian Forest Act), that the officers of the Forest Department in Bengal, mentioned in the first column of the following schedule, shall exercise the powers of "Forest Officers" under the sections of that Act mentioned in the second column of the same, over against each such class of officers respectively :—

Class of officers empowered.	Section of the Act under which powers are given.	Brief description of nature of powers conferred.
I.—All Deputy Conservators, Assistant Conservators, and Sub-Assistant Conservators when in charge of Forest Divisions.	20	Power to publish translation of notification of Reserved forests.
	25	Power to permit prohibited acts in Reserved forests.
	33	Power to permit prohibited acts in Protected forests.
	45	Power to notify depôts for drift timber, &c
	46	Power to issue notice to claimants of drift timber, &c.
	47	Power to decide claims to drift timber, &c.
	50	Power to receive payments on account of drift timber, &c.
	60	Power to direct release of property seized.
	67	Power to compound offences.
	82	Power to sell forest produce for Government dues.
II.—All Deputy Conservators, Assistant Conservators, Sub-Assistant Conservators, and Rangers in receipt of salaries of at least Rs. 100 per mensem, subordinate to any officer of class I, when specially authorized in that behalf by the Conservator of Forests.	25	Power to permit prohibited acts in Reserved forests.
	33	Power to permit prohibited acts in Protected forests.
	60	Power to direct release of property seized.
	67	Power to compound offences.
III.—All Rangers on salaries of less than Rs. 100 per mensem and Foresters subordinate to any officer of Class I, when specially authorized in that behalf by the Conservator of Forests.	35	Power to permit prohibited acts in Reserved forests.
	33	Power to permit prohibited acts in Protected forests.
	60	Power to direct release of property seized.
IV.—All Deputy Conservators, Assistant Conservators, Sub-Assistant Conservators, Rangers, Foresters, and Forest Guards, whether on permanent or temporary establishments.	45	Power of collecting drift timber, &c.
	52	Power to seize property liable to confiscation.
	55	Power to take charge of Government or confiscated property.
	56	Power to accept charge of property when offender is unknown.
	63	Power to arrest without warrant in certain cases.
	69	Power to seize and impound cattle trespassing.
	82	Power to take possession of produce under Government lien.

The 10th November, 1890.—*Mr. M. S. Fowler*, Deputy Conservator of Forests, in charge of the Chittagong Forest Division, is posted to the charge of the Darjeeling Sub-division of the Darjeeling Forest Division, on being relieved of his duties by *Mr. R. L. Heinig*, Assistant Conservator of Forests, at present on three months' privilege leave (granted him in the Government of Bengal Notification, dated 14th August, 1890).

Mr. H. H. Haines, Assistant Conservator of Forests, is attached to the Working Plans Division, until further orders, on being relieved of the charge of the Darjeeling Sub-division by *Mr. M. S. Fowler*.

The 25th November, 1890.—The report of the Central Examination Committee having been received, the result of the Half-yearly Departmental Examination of Assistant Magistrates and others, held in October, 1890, is published for general information—

Mr. W. H. Lovegrove, Assistant Conservator of Forests, has passed in Land Revenue and Hindustani by the Higher Standard.

Mr. E. J. N. James, Sub-Assistant Conservator of Forests, has passed in Hindustani by the Higher Standard.

The 16th December, 1890.—*Mr. M. S. Fowler*, Deputy Conservator of Forests, 4th grade, is granted six weeks' sick leave on medical certificate, with effect from the 3rd December, 1890.

Mr. H. H. Davis, Deputy Conservator of Forests, in charge of the Darjeeling Forest Division, is temporarily posted to the charge of the Darjeeling Sub-division of that Division, in addition to his other duties.

Mr. H. H. Haines, Assistant Conservator of Forests, in charge of the Darjeeling Sub-division, on being relieved by *Mr. Davis*, is attached to the Working Plans Division, until further orders.

5.—NORTH-WESTERN PROVINCES AND OUDH GAZETTE—

No. $\frac{4176}{\text{II—236B-2}}$.—*The 12th September, 1890.—Mr. E. McA. Moir*, Deputy Conservator of Forests, Jaunsar Division, is granted privilege leave for 36 days, with effect from the 20th September, 1890.

No. $\frac{4181}{\text{II—236B-7}}$.—*Mr. N. Hearle*, Deputy Conservator of Forests, Dehra Dún Division, to hold charge of Jaunsar Division, in addition to his own duties, during the absence on privilege leave of *Mr. E. McA. Moir*, or until further orders.

No. $\frac{4374}{\text{II—393A-29}}$.—*The 22nd September, 1890.—Mr. A. Smythies*, Deputy Conservator of Forests, has been granted by Her Majesty's Secretary of State for India permission to return to duty.

No. $\frac{4375}{\text{II—368A-5}}$.—*Mr. C. Bagshawe*, Conservator of Forests, in temporary charge of the School Circle, is granted furlough out of India for one year, with effect from the 15th October, 1890, or subsequent date.

No. $\frac{4456}{\text{II—865A-15}}$.—*The 29th September, 1890.—Mr. Montague Hill*, Assistant Conservator of Forests, in charge of the Pilibhit Forest

Division and Bhira Sub-division, to the charge of the Kheri Forest Division, on being relieved by *Mr. W. Shakespear*, until further orders.

No. $\frac{4461}{\text{II—865A-20}}$.—*Mr. A. Campbell*, Officiating Deputy Conservator of Forests, in charge of the Gorakhpur Forest Division, to the charge of the Kheri Division, Oudh Circle.

No. $\frac{4466}{\text{II—865A-25}}$.—*Mr. Montague Hill*, Assistant Conservator of Forests, in charge of the Kheri Forest Division, to the charge of the Gorakhpur Forest Division, Oudh Circle, on being relieved by *Mr. A. Campbell.*

No. $\frac{4451}{\text{II—865A-10}}$.—*Mr. Montague Hill*, Assistant Conservator of Forests, in charge of the Pilibhit Forest Division and Bhira Sub-division, held charge of the Kheri Division, Oudh Circle, in addition to his own duties, from the afternoon of the 3rd July, 1890, to the afternoon of the 7th July, 1890.

No. $\frac{4673}{\text{II—393A-31}}$.—*The 15th October, 1890.—Mr. A. Smythies*, Deputy Conservator of Forests, 3rd grade, on return from leave, to the charge of the Ganges Forest Division of the Central Circle.

No. $\frac{4948}{\text{II—393A-36}}$.—*The 5th November, 1890.—Mr. A. Smythies*, Deputy Conservator of Forests, 3rd grade, on return from furlough, to the charge of the Ganges Forest Division.

No. $\frac{5502}{\text{II—309B-2}}$.—*The 28th November, 1890.—Colonel J. E. Campbell*, Deputy Conservator of Forests, 2nd grade, has been granted by Her Majesty's Secretary of State for India permission to return to duty.

No. $\frac{5574}{\text{II—709-55}}$.—*The 3rd December, 1890.*—With effect from the 30th September, 1890, the date on which *Mr. H. Clifford*, Assistant Conservator of Forests, 1st grade, resigned his appointment—

Mr. B. A. Rebsch, Assistant Conservator of Forests, from 2nd grade to the 1st grade, but to continue to officiate as Deputy Conservator, 3rd grade.

No. $\frac{5210}{\text{II—393A-46}}$.—*The 13th November, 1890.*—This Department Notification No. $\frac{4948}{\text{II—393A-36}}$, dated 5th November, 1890, regarding the posting of *Mr. A. Smythies*, Deputy Conservator of Forests, 3rd grade, is hereby cancelled.

No. $\frac{5104}{\text{II—991B-17}}$.—*The 8th November, 1890.*—With effect from the 4th July, 1890, the date on which *Mr. W. G. Allan*, Deputy Conservator of Forests, 2nd grade, retired from the service, *Mr. McA. Moir*, Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 2nd grade.

No. $\frac{5112}{\text{II—86-13A-1}}$.—*The 10th November, 1890.*—With effect from 21st April, 1890, to fill an existing vacancy, *Mr. M. Hill*, Assistant Conservator of Forests, 2nd grade, to officiate as Assistant Conservator of Forests, 1st grade.

No. $\frac{5126}{\text{II—72B-15}}$.—*The 11th November, 1890.*—With effect from the 1st October, 1890, *Babu Raghunath Pathak*, Sub-Assistant Conservator of Forests, 3rd grade, to be Sub-Assistant Conservator of Forests, 2nd grade.

No. $\frac{5287}{\text{II—86A-141}}$.—*The 14th November, 1890.*—With effect from the 26th June, 1890, the date on which *Mr. A. G. Hobart-Hampden*, Officiating Deputy Conservator of Forests, 3rd grade, proceeded on leave—

Mr. B. A. Rebsch, Officiating Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. M. Hill, Officiating Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 4th grade.

No. $\frac{5288}{\text{II—86A-14-2}}$.—With effect from the 1st July, 1890, the date on which *Mr. B. A. Rebsch*, Officiating Deputy Conservator of Forests, 3rd grade, proceeded on privilege leave—

Mr. L. Mercer, Officiating Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

No. $\frac{5289}{\text{II-86A-14-3}}$.—With effect from the 8th July, 1890, the date on which he joined these Provinces—

Mr. W. Shakespear, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 2nd grade.

No. $\frac{5290}{\text{II-86A-14-4}}$.—With effect from the 24th September, 1890, the date on which *Mr. E. McA. Moir*, Deputy Conservator of Forests, 2nd grade, proceeded on privilege leave—

Mr. F. B. Bryant, Officiating Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. M. Hill, Officiating Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

No. $\frac{5291}{\text{II-86A-14-5}}$.—With effect from the 14th October, 1890, the date on which *Mr. B. A. Rebsch*, Officiating Deputy Conservator of Forests, 3rd grade, returned from privilege leave—

Mr. M. Hill, Officiating Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 4th grade.

No. $\frac{5292}{\text{II-86A-14-6}}$.—With effect from the 27th October, 1890, the date on which *Mr. Hobart-Hampden* returned from leave—

Mr. A. G. Hobart-Hampden, Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 3rd grade;

Mr. L. Mercer, Officiating Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 4th grade.

No. $\frac{5141}{\text{II-820-25}}$.—*The 11th November, 1890.*—On the return from privilege leave of *Mr. B. A. Rebsch, Mr. Raghunath Pathak*, Sub-Assistant Conservator of Forests, in charge of the Bahraich Forest Division, to be attached to the Gorakhpur Forest Division with effect from the 14th October, 1890.

6.—PUNJAB GAZETTE—

No. 385.—*The 23rd September, 1890.*—*Mr. R. J. P. Pinder*, Officiating Deputy Conservator of Forests, Chenab Forest Division, has obtained one month's privilege leave, under Article 277 of the Civil Service Regulations, with effect from the afternoon of the 21st August, 1890.

Babu Ladha Singh, Sub-Assistant Conservator of Forests, is appointed to the charge of the Chenab Forest Division with effect from the above date.

No. 388.—In Notifications Nos. 275 and 278, dated the 30th June, 1890, notifying the date on which *Messrs. G. G. Minniken* and *W. Shakespeur* made over and assumed charge of the Bashahr Division and the date on which *Mr. Minniken's* services were placed at the disposal of the Patiala State, *for* "the forenoon of the 19th March, 1890," *read* "the forenoon of the 11th March, 1890."

No. 418.—*The 14th October, 1890.*—With reference to Notification No. 966-S., dated the 1st October, 1890, *Mr. A. E. Wild*, Deputy Conservator of Forests, 1st grade, Hazara, assumed charge of the office of Conservator of Forests, Punjab, on the afternoon of the 10th October, 1890, relieving *Mr. R. Whittall*, proceeding on leave.

No. 427.—*The 21st October, 1890.*—*Messrs. A. E. Wild*, Deputy Conservator of Forests, and *A. V. Monro*, Assistant Conservator of Forests, respectively made over and assumed charge of the Hazara Forest Division on the afternoon of the 13th October, 1890.

No. 433.—*The 24th October, 1890.*—*Messrs. A. V. Monro* and *G. S. Hart*, Assistant Conservators of Forests, respectively made over and assumed charge of the Lahore Forest Division on the afternoon of the 11th October, 1890.

No. 440.—*The 28th October, 1890.*—With reference to Punjab Government Notification No. 388, dated the 23rd of September, 1890, the promotions consequent on the deputation of *Mr. G. G. Minniken* to the Patiala State, notified in Notification No. 177, dated the 15th of April, 1890, shall have effect from the 11th March, 1890.

No. 453.—*The 3rd November, 1890.*—*Mr. R. J. P. Pinder*, Officiating Deputy Conservator of Forests, on return from privilege leave, resumed charge of the Chenab Forest Division on the afternoon of the 16th October, 1890, relieving *Babu Ladha Singh*.

No. 481.—*The 7th November, 1890.*—In continuation of Punjab Government Notification No. 180 of the 15th April, 1890, it is hereby notified that *Mr. L. G. Smith*, Deputy Conservator of Forests, returned from leave on medical certificate on the forenoon of the 25th October, 1890, and has been attached to the Direction Division.

No. 485.—*The 8th November, 1890.*—In continuation of *Punjab Government Gazette* Notification No. 870-4, dated 25th September, 1888, *Major A. K. Macpherson*, Cantonment Magistrate, Meean Meer, is invested, under section 14 of the Code of Criminal Procedure, with the powers of a Magistrate of the 1st class, to be exercised for the purpose of dealing with offences under section 25 of the Indian Forests Act, 1878, within the limits of the areas

declared to be reserved forests by *Punjab Government Gazette* Notification No. 400, dated 6th October, 1890.

No. 507.—*The 21st November, 1890.*—*Messrs. G. S. Hart*, Assistant Conservator of Forests, and *L. G. Smith*, Deputy Conservator of Forests, respectively made over and received charge of the Direction Forest Division and the duties of Personal Assistant to the Conservator of Forests, Punjab, on the forenoon of the 18th November, 1890.

No. 516.—*The 1st December, 1890.*—*Mr. A. V. Monro*, Assistant Conservator of Forests, passed by the Higher Standard the Departmental Examination in Hindustani held at Lahore on the 29th October, 1890.

No. 525.—*The 6th December, 1890.*—*Mr. J. H. Lace*, Deputy Conservator of Forests, is granted three months' privilege leave, under Articles 277 and 291 of the Civil Service Regulations, with effect from the afternoon of the 25th November, 1890.

No. 531.—*Mr. A. L. McIntire*, Officiating Deputy Conservator of Forests, is granted three months' privilege leave, under Articles 277 and 291 of the Civil Service Regulations, with effect from the afternoon of the 25th November, 1890.

No. 537.—*The 9th December, 1890.*—*Mr. J. L. Pigot*, Officiating Deputy Conservator of Forests, is granted three months' privilege leave, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 25th December, 1890, or such subsequent date as he may avail himself of it.

No. 542.—*The 13th December, 1890.*—With reference to Notification No. 418, dated the 14th October, 1890, *Mr. R. Whittall*, on return from leave resumed charge of the office of Conservator of Forests, Punjab, on the forenoon of the 11th December, 1890, relieving *Mr. A. E. Wild.*

No. 547.—*The 15th December, 1890.*—Consequent on the transfer to the North-Western Provinces and Oudh of *Mr. W. Shakespear*, Officiating Deputy Conservator of Forests, 2nd grade, the Lieutenant-Governor is pleased to make the following permanent and temporary promotions with effect from the 4th July, 1890 :—

Mr. F. O. Lemarchand, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. W. E. D'Arcy, Officiating Deputy Conservator, 3rd grade, to be confirmed in that grade.

Mr. J. H. Lace, Officiating Deputy Conservator, 4th grade, sub. *pro tem.*, and officiating in the 3rd grade, to be confirmed in the former and to continue to officiate in the latter grade.

Mr. J. L. Pigot, Officiating Deputy Conservator, 4th grade, to be confirmed in that grade sub. *pro tem.*, and to officiate as Deputy Conservator, 3rd grade.

Mr. R. J. P. Pinder, Officiating Deputy Conservator, 4th grade, to be confirmed as Assistant Conservator, 1st grade.

Mr. G. S. Hart, Officiating Assistant Conservator, 1st grade, to be confirmed in that grade sub. *pro tem.*, and to officiate as Deputy Conservator, 4th grade.

No. 548.—Consequent on the return from privilege leave of *Mr. F. O. Lemarchand*, Officiating Deputy Conservator, 2nd grade,

the following reversions will have effect from the forenoon of the 8th August, 1890 :—

Mr. J. L. Pigot, from Officiating Deputy Conservator, 3rd grade, to Deputy Conservator, 4th grade, sub. *pro tem.*

Mr. G. S. Hart, from Officiating Deputy Conservator, 4th grade, to Assistant Conservator, 1st grade, sub. *pro tem.*

No. 549.—Consequent on the departure of *Mr. R. J. P. Pinder*, Officiating Deputy Conservator, 4th grade, on privilege leave, on the afternoon of the 21st August, 1890, *Mr. G. S. Hart*, Assistant Conservator, 1st grade, sub. *pro tem.*, to officiate as Deputy Conservator, 4th grade, with effect from the 22nd August, 1890.

No. 550.—Consequent on the departure on privilege leave of *Mr. R. H. C. Whittall*, Officiating Conservator of Forests, 2nd grade, and the appointment as Conservator, 3rd grade, of *Mr. A. E. Wild*, Deputy Conservator, 1st grade, the Lieutenant-Governor is pleased to make the following temporary promotions with effect from the 11th October, 1890 :—

Mr. W. E. D'Arcy, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. J. L. Pigot, Deputy Conservator, 4th grade, sub. *pro tem.*, to officiate as Deputy Conservator, 3rd grade.

No. 551.—Consequent on the return from leave of *Mr. W. H. Reynolds*, Deputy Conservator of Forests, 2nd grade, the following reversions shall have effect from the forenoon of the 24th October, 1890 :—

Mr. W. E. D'Arcy, Officiating Deputy Conservator, 2nd grade, to revert to Deputy Conservator, 3rd grade.

Mr. J. L. Pigot, Officiating Deputy Conservator, 3rd grade, to revert to Deputy Conservator, 4th grade, sub. *pro tem.*

Mr. G. S. Hart, Officiating Deputy Conservator, 4th grade, to revert to Assistant Conservator, 1st grade, sub. *pro tem.*

No. 552.—Consequent on the return from leave of *Mr. L. Gisborne Smith*, Deputy Conservator, 4th grade, the following temporary promotion and reversions shall have effect from the 25th October, 1890 :—

Mr. L. G. Smith, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. J. H. Lace, Officiating Deputy Conservator, 3rd grade, to revert to Deputy Conservator, 4th grade.

Mr. E. R. Murray, Officiating Deputy Conservator, 4th grade, to revert to Assistant Conservator, 1st grade, sub. *pro. tem.*

7.—CENTRAL PROVINCES GAZETTE—

No. 5949.—*The 20th September, 1890.*—Consequent on the return from privilege leave of *Colonel H. C. T. Jarrett*, V.C., Deputy Conservator of Forests, the following reversions are ordered with effect from the 13th August, 1890 :—

Mr. W. P. Thomas, Officiating Deputy Conservator, 2nd grade, to Deputy Conservator, 3rd grade.

Mr. H. Moore, Officiating Deputy Conservator, 3rd grade, to Deputy Conservator, 4th grade, sub. *pro tem.*

Mr. G. F. Taylor, Deputy Conservator, 4th grade, sub. *pro tem.* in Berar (on privilege leave), to Officiating Deputy Conservator, 4th grade.

Mr. H B. Anthony, Deputy Conservator, 4th grade, sub. *pro tem.*, to Officiating Deputy Conservator, 4th grade.

Mr. A. E. Lowrie, Officiating Deputy Conservator, 4th grade, to Assistant Conservator, 1st grade, sub. *pro tem.*

Mr. A. Watson, Assistant Conservator, 1st grade, sub. *pro tem.*, to Officiating Assistant Conservator, 1st grade.

Mr. A. F. Gradon, Officiating Assistant Conservator, 1st grade, to Assistant Conservator, 2nd grade.

No. 5951.—*Mr. J. J. Hobday*, Sub-Assistant Conservator of Forests, Sambalpur, availed himself, on the forenoon of the 20th ultimo of the privilege leave for two months and ten days granted him by Notification No. 4404, dated the 16th July, 1890.

No. 5992.—*The 23rd September, 1890.*—In Notification No. 2960, dated the 17th May last, *for* "the 28th April, 1890," *read* "the 1st April, 1890," as the date from which *Mr. S. G. Paranjpe* was appointed Sub-Assistant Conservator of Forests, 3rd grade.

No. 6195.—*The 2nd October, 1890.*—With reference to Notification No. 5391, dated the 25th August, 1890, *Mr. Shridhar Ganesh Paranjpe*, Sub-Assistant Conservator of Forests, on being relieved by *Mr. A. Stewart*, Deputy Conservator of Forests, is transferred from the Damoh to the Nimar Forest Division.

Mr. Paranjpe received charge of his duties in the Nimar Forest Division on the forenoon of the 28th August, 1890.

No. 6382.—*The 10th October, 1890.*—*Mr. F. B. Dickinson*, Deputy Conservator of Forests, Working Plans Division, Northern Circle, Central Provinces, reported his departure from Jubbulpore on the afternoon of the 30th September, 1890, on transfer to Berar.

No. 6390.—*Mr. F. C. Hicks*, Assistant Conservator of Forests, Mandla Division, is transferred to the Jubbulpore Forest Division.

No. 6832.—*The 28th October, 1890.*—Consequent on the re-transfer to Bombay of *Mr. A. Stewart*, Deputy Conservator of Forests, *Mr. Shridhar Ganesh Paranjpe*, Sub-Assistant Conservator, Nimar Forest Division, is posted as Divisional Forest Officer to Damoh.

No. 6884.—*Mr. M. Muttannah*, Assistant Conservator of Forests of the 3rd grade, is promoted to the 2nd grade of Assistant Conservators, with effect from the 1st January, 1890.

No. 6876.—*Mr. J. J. Hobday*, B.A., Sub-Assistant Conservator of Forests, 3rd grade, sub. *pro tem.*, in the Sambalpur Forest Division, is confirmed in that grade, with effect from the 1st June, 1890.

No. 6889.—Consequent on the appointment of *Mr. F. B. Dickinson* as Officiating Conservator of Forests, Berar, the following officiating promotions among Forest Officers are ordered, with effect from the 1st October, 1890 :—

Mr. W. P. Thomas, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. Moore, Deputy Conservator, 4th grade, sub. *pro tem.*, to officiate as Deputy Conservator, 3rd grade.

Mr. G. F. Taylor, Officiating Deputy Conservator, 4th grade

(on privilege leave), to be Deputy Conservator, 4th grade, sub. *pro tem.*

Mr. H. B. Anthony, Officiating Deputy Conservator, 4th grade, to be Deputy Conservator, 4th grade, sub. *pro tem.*

Mr. A. E. Lowrie, Assistant Conservator, 1st grade, sub. *pro tem.*, to officiate as Deputy Conservator, 4th grade.

Mr. A. Watson, Officiating Assistant Conservator, 1st grade, to be Assistant Conservator, 1st grade, sub. *pro tem.*

Mr. A. F. Gradon, Assistant Conservator, 2nd grade, to officiate as Assistant Conservator, 1st grade.

No. 6890.—Consequent on the return from privilege leave of *Mr. G. F. Taylor*, Officiating Deputy Conservator of Forests, Berar, the following reversions are ordered, with effect from the 2nd October, 1890:—

Mr. H. B. Anthony, Deputy Conservator, 4th grade, sub. *pro tem.*, to Officiating Deputy Conservator, 4th grade.

Mr. A. F. Lowrie, Officiating Deputy Conservator, 4th grade, to Assistant Conservator, 1st grade, sub. *pro tem.*

Mr. A. Watson, Assistant Conservator, 1st grade, sub. *pro tem.*, to Officiating Assistant Conservator, 1st grade.

Mr. A. F. Gradon, Officiating Assistant Conservator, 1st grade, to Assistant Conservator, 2nd grade.

No. 7128.—*The 10th November, 1890.*—Leave on medical certificate for fifteen months, under Article 369 of the Civil Service Regulations, is granted to *Mr. W. King*, Deputy Conservator of Forests, Mandla, with effect from the date on which he may avail himself of it.

No. 7165.—*The 11th November, 1890.*—*Mr. A. M. Caccia*, Assistant Conservator of Forests, Bhandara, is transferred to the Hoshangabad Forest Division.

No. 7228.—*The 15th November, 1890.*—*Mr. Clutterbuck*, Assistant Conservator of Forests, Raipur Division, is transferred to the Chanda Division, for employment as Sub-Divisional Officer in charge of the Pranhita-Godavery Sub-Division.

No. 7229.—*Mr. Ramchandra Krishna*, Sub-Assistant Conservator of Forests, Chanda Division, is appointed Sub-Divisional Officer in charge of the Moharli Sub-Division.

No. 7426.—*The 22nd November, 1890.*—With reference to Notification No. 5951, dated the 20th September, 1890, *Mr. J. J. Hobday*, Sub-Assistant Conservator of Forests, Sambalpur, returned from privilege leave and resumed charge of his duties on the afternoon of the 25th ultimo. The unexpired portion (four days) of the leave granted him is hereby cancelled.

No. 7427.—*The 24th November, 1890.*—With reference to Notification No. 6832, dated the 28th October, 1890, *Mr. A. Stewart*, Deputy Conservator of Forests, and *Mr. S. G. Paranjpe*, Sub-Assistant Conservator of Forests, respectively made over and assumed charge of the Damoh Forest Division on the afternoon of the 31st idem.

No. 7450.—*The 25th November, 1890.*—*Mr. W. King*, Deputy Conservator of Forests, Mandla, availed himself, on the afternoon of the 1st instant, of the fifteen months' leave on medical certificate granted him by Notification No. 7128, dated the 10th idem,

making over charge of his duties, temporarily, to the Deputy Commissioner, Mandla.

No. 7486.—*The 27th November, 1890.*—*Mr. Chunder Kumar Chatterji*, Sub-Assistant Conservator of Forests, Hoshangabad, is transferred to the Narsinghpur Forest Division.

No. 7487.—On being relieved by *Mr. Chunder Kumar Chatterji*, of the charge of the Narsinghpur Forest Division, *Mr. M. Muttannah*, Assistant Conservator of Forests, is transferred to the Mandla Forest Division.

No. 7488.—With reference to Notifications Nos. 7486 and 7487, dated the 27th instant, *Messrs. M. Muttannah* and *Chunder Kumar Chatterji* respectively made over and assumed charge of the Narsinghpur Forest Division on the forenoon of the 5th idem

No. 7489.—With reference to Notification No. 7487, dated the 27th instant, *Mr. M. Muttannah*, Assistant Conservator of Forests, assumed charge of the Mandla Forest Division from the Deputy Commissioner, on the afternoon of the 10th idem.

No. 7490.—Under section 46 of Act XVIII. of 1881 (the Central Provinces Land Revenue Act) as amended by section 15 of Act XVI. of 1889, the Chief Commissioner is pleased to declare the forest mahals of the Zamindari estates in the Raipur, Bilaspur, and Sambalpur Districts, as defined by the Settlement Officer, to be forest mahals within the meaning of the said section.

No. 7491.—In exercise of the powers conferred by section 124A of Act XVIII. of 1881 (the Central Provinces Land Revenue Act) as amended by Act XVI. of 1889, the Chief Commissioner is pleased to make the following Rules regarding the management of forest lands within the forest mahals of Zamindari estates in the Raipur, Bilaspur, and Sambalpur Districts:—

I.—No *dahia* or *bewar* cultivation will be permitted in tracts in which this is prohibited by the Deputy Commissioner.

II.—In tracts which are specially reserved under the orders of the Deputy Commissioner, no timber may be cut except by his express permission. Such permission will be given in writing and will specify the character and amount of the timber to be cut in each case.

III.—In working the forests included in the tracts to which Rule II. applies, Zamindars will carefully observe any instructions issued by the Deputy Commissioner.

IV.—An account must be kept by the Zamindar of all timber cut in forests to which Rule II. applies: all timber removed from such forests must be covered by passes formally issued and registered under such detailed instructions as the Deputy Commissioner may issue.

No. 7534.—With reference to Notification No. 7165, dated the 11th November, 1890, *Mr. A. M. Caccia*, Assistant Conservator of Forests, relinquished charge of his duties in the Bhandara Forest Division on the forenoon of the 18th idem.

No. 7712.—With reference to Notification No. 7486, dated the 27th ultimo, *Mr. Chunder Kumar Chatterji*, Sub-Assistant Conservator of Forests, made over charge of his duties in the Hoshang-

abad Forest Division to *Mr. W. P. Thomas*, Forest Divisional Officer, on the afternoon of the 31st October, 1890.

8.—BURMA GAZETTE—

No. 15.—*The 1st September, 1890.*—*Mr. J. Nisbet*, Deputy Conservator of Forests, made over, and *Mr. W. F. L. Tottenham*, Assistant Conservator of Forests, received, charge of the Rangoon Division on the afternoon of the 29th ultimo.

No. 142.—*The 3rd September, 1890.*—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for two months and twenty-eight days is granted to *Mr. C. R. Dun*, Sub-Assistant Conservator of Forests, with effect from the date on which he may avail himself of it.

No. 143.—*The 4th September, 1890.*—Under the provisions of section 4, sub-section (2), of the Upper Burma Forest Regulation, 1887, the Chief Commissioner appoints the Deputy Conservator of Forests, Katha Division, to be the Forest Officer to assist the Forest Settlement Officer in the enquiry prescribed by Chapter II. of the Regulation and referred to in this department Notification No. 38, dated the 27th February, 1890.

No. 144.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for two months and twenty-three days was granted to *Mr. J. Nisbet*, Deputy Conservator of Forests, with effect from the date on which he availed himself of it.

This supersedes this department Notification No. 123 (Forests), dated the 31st July, 1890.

No. 20.—*The 8th September, 1890.*—*Mr. R. C. Dun*, Sub-Assistant Conservator of Forests, availed himself of the privilege leave granted him in Revenue Department Notification No. 142 (Forests), dated the 3rd September, 1890, on the afternoon of the 4th September, 1890.

No. 2.—*The 9th September, 1890.*—With the sanction of the Chief Commissioner *Mr. W. S. Adjie*, Head Clerk, Office of the Deputy Conservator of Forests, Kado Division, is appointed officer in charge of the Kado sub-division, with effect from the 18th August, 1890, *vice Mr. R. M. G. Martin.*

No. 156.—*The 10th September, 1890.*—On his return from privilege leave *Mr. C. L. Toussaint*, Assistant Conservator of Forests, is posted to the charge of the Yaw Division.

No. 157.—On being relieved by *Mr. Toussaint*, *Mr. C. W. Palmer*, Deputy Conservator of Forests, is transferred from Pakôkku to Mandalay, and is appointed to be Personal Assistant to the Conservator, Upper Burma Circle, and to take charge of the Direction Division during the absence on privilege leave of *Mr. C. E. Muriel* or till further orders.

No. 163.—*The 25th September, 1890.*—The following temporary promotions are ordered :—

(1). With effect from the 25th June, 1890, consequent on the departure on furlough of *Mr. L. A. W. Rind*, Deputy Conservator of Forests, 2nd grade—

Mr. H. Slade, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. J. Copeland, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. C. L. Toussaint, Assistant Conservator, 1st grade, to officiate as Deputy Conservator, 4th grade.

(2). With effect from the 9th July, 1890, consequent on the departure on furlough of *Mr. E. P. Popert*, Conservator of Forests, Pegu Circle—

Mr. T. Hauxwell, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. A. Hoghton, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

(3). With effect from the 30th September, 1890, consequent on the departure on privilege leave of *Mr. J. Nisbet*, Deputy Conservator of Forests, 2nd grade:

Mr. E. S. Carr, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. C. H. Hobart-Hampden, Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade.

No. 22.—*The 29th September, 1890.*—With reference to Revenue Department Notification No. 86, dated the 14th June, 1890, *Mr. C. L. Toussaint*, Officiating Deputy Conservator of Forests, reported his return to duty from privilege leave on the forenoon of the 16th instant.

No. 23.—With reference to Revenue Department Notifications Nos. 156 and 157, dated the 10th instant, *Mr. C. W. Palmer*, Deputy Conservator of Forests, made over, and *Mr. C. L. Toussaint*, Officiating Deputy Conservator of Forests, received, charge of the Yaw Division on the forenoon of the 25th instant.

No. 24.—*Mr. J. W. Oliver*, Officiating Conservator of Forests, made over, and *Mr. C. W. Palmer*, Deputy Conservator of Forests, received, charge of the Direction Division, and entered upon his duties as Personal Assistant to the Conservator of Forests on the forenoon of the 20th instant.

No. 176.—*The 23rd October, 1890.*—In exercise of the power conferred by section 8, sub-section (1), of the Upper Burma Laws Act, 1886, the Chief Commissioner is pleased, with the previous sanction of the Governor-General in Council, to extend the Upper Burma Forest Regulation, 1890, to all the territories which may from time to time be declared by notification under section 8, sub-section (3), of the said Upper Burma Laws Act, 1886, to constitute the Shan States.

No. 177.—The Chief Commissioner is pleased to direct that the following clause shall be substituted for clause (*d*) of sub-section (*i*) of Rule 8 of the Rules made under the Burma Forest Act, 1881, published in this department Notification No. 108, dated the 1st August, 1889:—

(*d*) such timber is cut, sawn, converted, or removed under and subject to the conditions of a license granted by the Deputy Commissioner or Forest Officer of the district, or by any officer empowered by the Deputy Commissioner in that behalf, in one or other of the Forms Nos. VI., VII., VIII., IX., and IXA., given in Appendix to these rules.

No. 178.—The following transfers of officers of the Forest Department are ordered:—

Mr. H. Jackson, Deputy Conservator, on his return from privilege leave, to the Shan States.

Mr. G. F. R. Blackwell, Officiating Deputy Conservator, from Tigyaing to the charge of the Shewgyin Division.

Mr. C. H. Hobart-Hampden, Deputy Conservator, from Shwegyin to the charge of the Prome Division.

Mr. F. J. Branthwaite, Assistant Conservator, from Prome to the Tharrawaddy Division.

No. 176.—*The 3rd October, 1890.*—The following transfers of officers of the Forest Department are ordered:—

Mr. H. Jackson, Deputy Conservator, on his return from privilege leave, to the Shan States.

Mr. G. F. R. Blackwell, Officiating Deputy Conservator, from Tigyaing to the charge of the Shwegyin Division.

Mr. C. H. Hobart-Hampden, Deputy Conservator, from Shwegyin to the charge of the Prome Division.

Mr. F. J. Branthwaite, Assistant Conservator, from Prome to the Tharrawady Division.

No. 183.—*The 30th October, 1890.*—*Mr. P. J. Carter*, Officiating Conservator of Forests, Pegu Circle, is placed in charge of the Tenasserim Circle, in addition to his other duties, during the absence on privilege leave of *Major C. T. Bingham*, or until further orders.

No. 268.—*The 6th November, 1890.*—At the departmental examination held at Rangoon on the 3rd and 4th November, 1890, the following officers passed the examination in the Burmese language by the standards specified below:—

Lower Standard.

Mr. H. Carter, Assistant Conservator of Forests.

Mr. W. F. L. Tottenham, Assistant Conservator of Forests.

No. 191.—*The 8th November, 1890.*—On his return from privilege leave *Mr. C. F. Muriel*, Deputy Conservator of Forests, is appointed to be Personal Assistant to the Conservator of Forests, Upper Burma Circle, and to the charge of the Direction Division, Upper Burma Circle.

No. 192.—*Mr. C. W. Palmer*, Deputy Conservator of Forests, on being relieved by *Mr. Muriel*, is transferred from Mandalay to the Bhamo Division.

No. 193.—*The 13th November, 1890.*—Under the provisions of section 35, clause (2) (*b*), of the Forest Department Code, *Mr. E. B. Powell* is appointed to be a Sub-Assistant Conservator of Forests, 2nd grade, on probation, and is posted to the Pegu Circle.

No. 194.—On being relieved by *Mr. J. Nisbet*, *Mr. W. F. L. Tottenham*, Assistant Conservator of Forests, is appointed to be Personal Assistant to the Conservator of Forests, Pegu Circle.

No. 195.—*Mr. W. T. T. McHarg*, Assistant Conservator of Forests, is transferred from Paungde to the Tenasserim Circle.

No. 274.—At the departmental examinations held at Mandalay and Moulmein on the 3rd and 4th November, 1890, the following officer passed the examinations in the Burmese language by the standard specified:—

Higher Standard.

Mr. C. W. Allan, Sub-Assistant Conservator of Forests.

No. 25.—*The 18th November, 1890.*—With reference to Revenue Department Notification No. 191 (Forests), dated the 8th November, 1890, *Mr. C. E. Muriel*, Deputy Conservator of Forests, reported his return from privilege leave on the afternoon of the 29th October, and received charge of the Direction Division from *Mr. C. W. Palmer*, Deputy Conservator of Forests, on the morning of the 30th October, 1890.

No. 26.—With reference to Revenue Department Notification No. 192 (Forests), dated the 8th November, 1890, *Mr. C. W. Palmer*, Deputy Conservator of Forests, received charge of the Bhamo Division from *Mr. E. A. O'Bryen*, Assistant Conservator of Forests, on the forenoon of the 3rd November, 1890.

No. 199.—*The 19th November, 1890.*—The following transfers are ordered:—

Mr. C. W. Allan, Sub-Assistant Conservator of Forests, from Yamethin to the charge of Myadaung Sub-division, Katha Division.

Mr. W. J. Lane-Ryan, Sub-Assistant Conservator of Forests, from Pyinmana to the charge of the Mandalay Revenue Sub-division, Mandalay Division.

No. 202.—*The 20th November, 1890.—Mr. H. Carter*, Assistant Conservator of Forests, is posted to the charge of the Working Plans Division.

No. 16.—*Mr. C. H. Hobart-Hampden*, Deputy Conservator of Forests, made over, and *Mr. G. F R. Blackwell*, Officiating Deputy Conservator of Forests, received, charge of the Shwegyin Division on the afternoon of the 18th instant.

No. 17.—*The 25th November, 1890.—Mr. W. F. L. Tottenham*, Assistant Conservator of Forests, assumed charge of his duties as Personal Assistant to the Conservator on the afternoon of the 24th instant.

No. 18.—*Mr. W. F. L. Tottenham*, Assistant Conservator of Forests, made over, and *Mr. J. Nisbet*, Deputy Conservator of Forests, assumed, charge of the Rangoon Division on the forenoon of the 24th instant.

No. 206.—*The 26th November, 1890.*—The following promotions are ordered, with effect from the 5th November, 1890:—

Mr. H. Carter, Assistant Conservator of Forests, 3rd grade, to be an Assistant Conservator, 2nd grade.

Mr. W. F. L. Tottenham, Assistant Conservator of Forests, 3rd grade, to be an Assistant Conservator, 2nd grade.

No. 207.—With reference to the provisions of section 62, sub-section (i), of the Upper Burma Forest Regulation, 1887, as amended by the Upper Burma Forest Regulation, 1890, the Chief Commissioner empowers every Deputy Conservator in charge of a Forest Division and every Assistant Conservator or Sub-Assistant Conservator in charge of the current duties of the office of a Divisional Officer, in the absence of such officer, to exercise the powers conferred by that section.

No. 208.—*Mr. G. R. Long*, Assistant Conservator of Forests, is transferred from the Western Division to the Toungoo Division.

No. 209.—*Mr. E. B. Powell*, Sub-Assistant Conservator of Forests, is posted to the Western Division.

No. 19.—*The 26th November, 1890.*—*Mr. F. J. Branthwaite*, Assistant Conservator of Forests, made over, and *Mr. C. H. Hobart-Hampden*, Deputy Conservator of Forests, received, charge of the Prome Division on the afternoon of the 24th instant.

No. 20.—*The 1st December, 1890.*—*Mr. G. Q. Corbett*, Deputy Conservator of Forests, made over, and *Mr. H. Carter*, Assistant Conservator of Forests, received, charge of the Working Plans Division on the afternoon of the 29th ultimo.

No. 21.—*Mr. G. R. Long*, Assistant Conservator of Forests, made over, and *Mr. E. B. Powell*, Probationary Sub-Assistant Conservator of Forests, received, charge of the Myanaung Sub-division on the afternoon of the 29th ultimo.

No. 22.—*The 5th December, 1890.*—*Mr. W. T. T. McHarg*, Assistant Conservator of Forests, made over charge of the Paungdé Subdivision to *Mr. C. H. Hobart-Hampden*, Deputy Conservator of Forests, Prome.

No. 3.—*The 8th December, 1890.*—*Mr. T. A. Hauxwell*, Deputy Conservator of Forests, made over, and *Mr. W. T. T. McHarg*, Assistant Conservator of Forests, received, charge of the East Salween Division on the afternoon of the 5th December, 1890.

No. 27.—With reference to Revenue Department Notification No. 176 (Forests), dated the 23rd October, 1890, *Mr. H. Jackson*, Deputy Conservator of Forests, assumed charge of his duty in Mandalay on the 16th November, before noon.

No. 216.—Under the provisions of section 4 (2) of the Upper Burma Forest Regulation, 1887, the Chief Commissioner appoints *Mr. T. H. Aplin*, Deputy Conservator of Forests, Minbu Division, to be the Forest Officer to assist the Forest Settlement Officer in the enquiry prescribed by Chapter II. of the Regulation and referred to in this Department Notification No. 215, dated the 8th December, 1890.

No. 217.—*The 9th December, 1890.*—With reference to the provisions of section 66 of the Burma Forest Act, 1881, as amended by Act V. of 1890, the Chief Commissioner empowers every Deputy Conservator in charge of a Forest Division and every Assistant Conservator or Sub-Assistant Conservator in charge of the current duties of the office of a Divisional Officer in the absence of such officer to exercise the powers conferred by that section.

No. 218.—*The 11th December, 1890.*—In the third line of the description of the west boundaries of the Nanmè Reserve in this Department Notification No. 197 (Forests), dated the 13th November, 1890, *for* the words "and thence west down the Thechaung" *read* "and thence west down the chaung."

No. 219.—With reference to Revenue Department Notification No. 57, dated the 15th April, 1890, *Mr. G. M. S. Carter*, Officiating Deputy Commissioner, is appointed to succeed *Mr. W. C. Midwinter*, as Forest Settlement Officer in respect of the proposed Chaungmangè Reserve.

No. 220.—*Mr. H. A. Hoghton*, Deputy Conservator of Forests, is appointed under section 6 of the Burma Forest Act, 1881, in place of *Mr. J. Nisbet*, to assist the Forest Settlement Officer in the inquiry in respect of the proposed Chaungmangè Reserve.

9.—ASSAM GAZETTE—

No. 7445.—*The 5th September, 1890.*—*Mr. J. C. Kelly*, Sub-Assistant Conservator of Forests, having resumed charge of his duties on the forenoon of the 11th August, 1890, the unexpired portion of the privilege leave granted him in Notification No. 4183G., dated 18th June, 1890, is hereby cancelled.

No. 8062.—*The 1st October, 1890.*—The following is published for information :—

Mr. C. G. D. Fordyce, Deputy Conservator of Forests, Assam, has been granted by Her Majesty's Secretary of State for India permission to return to duty within period of leave.

No. 8519.—*The 10th October, 1890.*—Leave of absence for fifteen days, under Articles 277 and 291, Chapter XII. of the Civil Service Regulations, is granted to *Mr. H. G. Young*, Assistant Conservator of Forests, Cachar Division, with effect from the 10th October, 1890, or the subsequent date on which he may avail himself of it.

No. 8520.—*Babu Tara Kisor Gupta*, Sub-Assistant Conservator of Forests, Sylhet Division, is placed in charge of the Cachar Division during the absence of *Mr. H. G. Young* on privilege leave, in addition to his own duties.

No. 8646.—*The 17th October, 1890.*—*Mr. C. G. D. Fordyce*, Deputy Conservator of Forests, on return from furlough, is placed in charge of the Sibsagar Forest Division.

No. 8647.—*Mr. W. F. Lloyd*, Assistant Conservator of Forests, Sibsagar Forest Division, on being relieved by *Mr. C. G. D. Fordyce*, is placed in charge of the Darrang Forest Division.

No. 8647.—*Mr. J. C. Kelly*, Sub-Assistant Conservator of Forests, on being relieved by *Mr. W. F. Lloyd*, is attached to the Imperial Forest Survey Branch, in the Goalpara District.

No. 8687.—*The 18th October, 1890.*—*Babu Tara Kisor Gupta*, Sub-Assistant Conservator of Forests, received charge of the Sylhet Forest Division from *Mr. H. G. Young*, Assistant Conservator, on the afternoon of the 4th October, 1890.

No. 8688.—*Mr. C. P. Fisher*, Assistant Conservator of Forests, received charge of the Working Plans Division from the Conservator of Forests on the forenoon of the 29th September, 1890.

No. 9032.—*The 8th November, 1890.*—*Babu Jogeswar Sur*, Sub-Assistant Conservator of Forests, Nowgong Division, is placed in charge of the Gáro Hills Forest Division during the absence on furlough of *Mr. T. J. Campbell*, or until further orders.

No. 9595.—*The 20th November, 1890.*—General Department Notifications No. 8519G. and No. 8520G., dated the 10th October, 1890, published at page 584 of the *Assam Gazette* of the 11th October, 1890, granting privilege leave of absence for fifteen days to *Mr. H. G. Young*, Assistant Conservator of Forests, Cachar Division, and placing *Babu Tara Kisor Gupta*, Sub-Assistant Conservator of Forests, in charge of the Cachar Forest Division during *Mr. Young's* absence on leave, are hereby cancelled.

No. 10259.—*The 2nd December, 1890.*—*Babu Jogeswar Sur*, Sub-Assistant Conservator of Forests, made over charge of the Now-

gong Forest Division to the Deputy Commissioner of Nowgong on the forenoon of the 11th November, 1890.

No. 10360.—*The 5th December, 1890.*—*Babu Jogeswar Sur*, Sub-Assistant Conservator of Forests, received charge of the Gáro Hills Forest Division from *Mr. T. J. Campbell*, Officiating Deputy Conservator, on the afternoon of the 19th November, 1890.

No. 10516.—*The 11th December, 1890.*—*Mr. C. G. D. Fordyce*, Deputy Conservator of Forests, on return from furlough, received charge of the Sibsagar Forest Division from *Mr. W. F. Lloyd*, Assistant Conservator, on the forenoon of the 24th November, 1890.

No. 10517.—*Mr. T. J. Campbell*, Officiating Deputy Conservator, 4th grade, reverted to the appointment of Assistant Conservator of Forests, 1st grade, with effect from the forenoon of the 24th November, 1890, the date on which *Mr. C. G. D. Fordyce* returned from furlough.

10.—Mysore Gazette.

Nil.

11.—Berar Gazette.

Nil.

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